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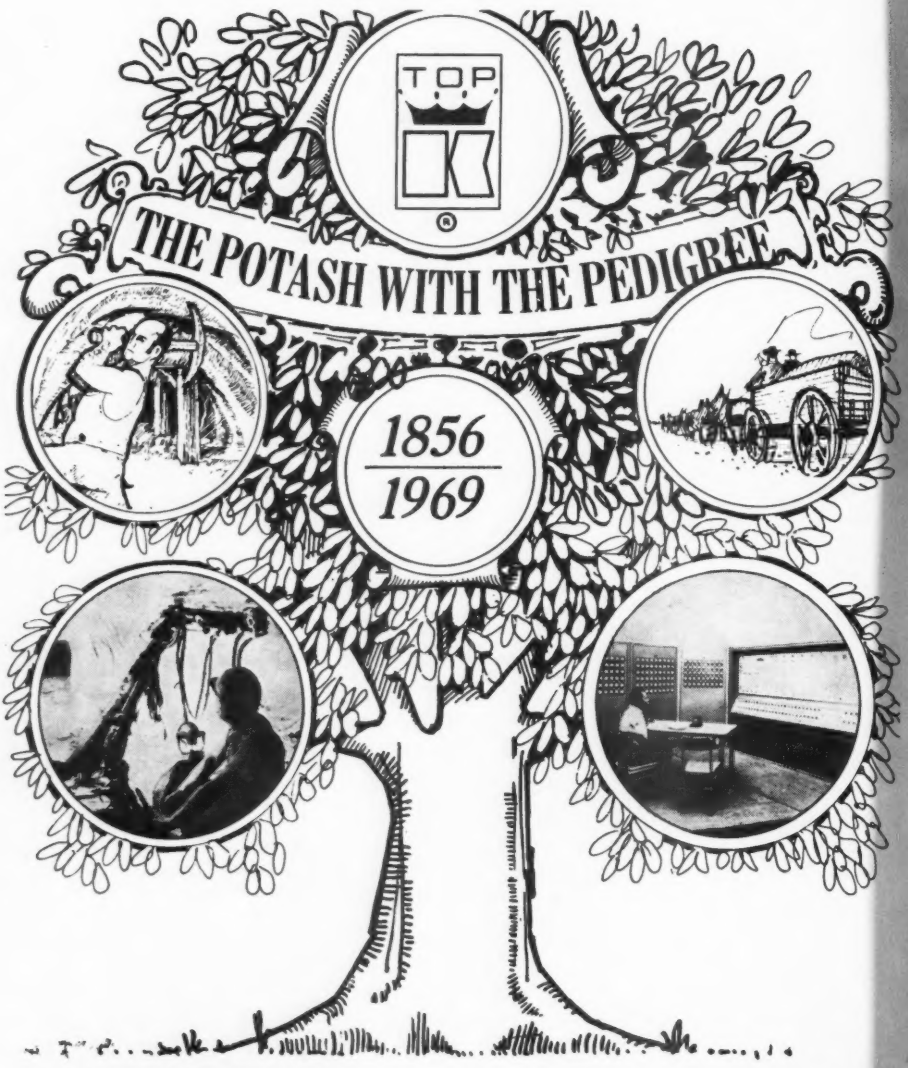
Seale-Hayne Agricultural College Farm page 56



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What are the trends in the eating habits of the British people? A Report, 'Household Food Consumption and Expenditure—1966', recently published for the Ministry of Agriculture, Fisheries and Food, by H.M. Stationery Office, gives a wealth of information about our choice of foods today

Food and the Purse

S. R. O'Hanlon

To put a nation's pattern of eating under the statistician's microscope is to reveal the mainspring of that nation's life. Much of the world's turbulent history, the migrations of people and the growth of civilization can be traced to the demand for sufficient food. What exactly constitutes food is another matter; it varies with race and region, and with educational development; sometimes it is the subject of superstition and related taboos, sometimes of prejudice, but always it is the palate that is the final arbiter.

The habits of eating in Britain have undergone considerable changes over the centuries, reflecting until the eighteenth century a predominantly subsistence level of agriculture, landed interests which produced game in profusion, and economic changes which brought the crops of tropical and sub-tropical climates to a growing number of people. No longer do we have the lusty appetites of some Stuart circles which sat down to gargantuan meals three, and even four, times a day, nor those of Victorian times when middle-class families, riding the crest of a new-found commercial prosperity, laid massive meals on their polished mahogany tables. Our choice of foods today, which mirrors a deeper dietary knowledge and a greater concern for our health, shows more discernment; and with the coming of refrigeration and the advance along the whole front of food technology, that choice is wider than it has ever been. So when we examine the profusion of figures so painstakingly presented in the latest *Report of the National Food Survey*,* we are looking not so much at a statistician's concept of Arcadia as at a contemporary social document of the first importance.

The National Food Survey, which was started in 1940, is a continuing sample inquiry into the domestic food consumption and expenditure of private households in Great Britain. Until 1950 it was confined to urban working-class households, but since then it has been extended to all classes and all parts of the country. In 1966 more than 7,100 households contributed information as to the type of food bought and what fraction of their incomes was spent on it. A single year's figures are of course of little value in themselves, since sampling and other short-term variations could distort the

*__Household Food Consumption and Expenditure:__ 1966. H.M. Stationery Office, 1968. Price 23*s.* (by post 24*s.* 2*d.*).

picture in a single year, and for this reason the figures for 1966 are considered in the context of developments over the previous six years. The figures must also be examined against the general economic background. During the course of 1966, measures had to be taken to limit home demand and release more resources for exports to help redress our balance of overseas payments, including the Selective Employment Tax and a six-months' standstill on prices and incomes. 'Averaged over the year', says the Report, 'personal disposable income per head was nearly 5 per cent greater than in 1965, although the real gain per head was limited to about 1 per cent since retail prices had advanced by some 4 per cent.' A supplement giving provisional analagous figures for 1967 adds considerably to the value of the Report as a whole.

Share of the purse

The average weekly household expenditure on food in Great Britain in 1966 was about $4\frac{1}{4}$ per cent greater than in 1965, whilst food prices rose on average by only three-quarters of this amount. The average weekly budget was 35*s.* 11*d.* per person in 1966 compared with 34*s.* 5*d.* in 1965. The provisional figure for 1967 is shown as 36*s.* 11*d.*, an increase of a shilling on the previous year, and due mainly to greater spending on bread, processed meats, fruit and vegetables, liquid milk and cheese, in that order.

How foods compete with each other for that earmarked part of the purse is a study in itself, subject as much to the varying influences of size and age of family, home circumstances, personal preferences and seasonal availability as it is to price differentiation. It has also to be remembered to what sales pressures the housewife is exposed by television advertising and the multitude of processed and attractively packaged foods that are stacked on the shelves in any supermarket. And in this connection it is of outstanding interest to note the growth in the consumption of purely convenience foods. In 1960, out of a total food expenditure of 29*s.* 8*d.* per head per week, 6*s.* 3*d.* (21 per cent) was spent in this way; in 1966, out of a total of 35*s.* 11*d.*, the figure was 8*s.* 3*d.* (23 per cent).

Broadly speaking, however, very little change is seen in the pattern of household food consumption. Nearly one-third of the average weekly food bill is spent on meat and meat products, of which carcass meat and poultry account for more than half. Taking the 1967 provisional figures, the average consumption of beef increased by nearly $\frac{1}{2}$ oz per person per week, while that of pork, after a rise between 1960 and 1965, fell by about the same amount. Demand for mutton and lamb also declined, leaving our consumption of carcass meat at 17 oz per person per week. But we ate more canned meat and meat products, and the consumption of broiler poultry continued to rise. Total purchases of eggs were maintained at an average of $4\frac{1}{2}$ per person per week, but unstamped eggs (no doubt with the magic tag 'free-range') continued to displace stamped eggs. Fish consumption, at 5·8 oz per person per week has remained virtually unchanged since 1960.

Apparently conscious of how insidiously the inches are put on, the disciplined among us are eating less bread, cakes and pastry. Of bread alone, we were consuming 45·5 oz per person per week in 1960, but by 1967 it was down to 40 oz. But it seems that although large white loaves are losing ground to smaller loaves and to brown bread, most of us still prefer large white loaves ready wrapped (and sliced as an additional convenience?)

The same consideration of weight watching is probably the reason why the average purchases of sugar have fallen by 8 per cent to 17 oz per person per week since 1963; similarly our diminished demand for preserves and syrups. Whether the traditional English breakfast of bacon and eggs in private households (as opposed to the immutable menus in our hotels) is in decline is not strictly apparent from the figures of the Report, but certainly the popularity of breakfast cereals (at 2·35 oz per person per week) continues to spiral.

Reduced buying of fats, notably of margarine, noticed in 1965 was still marked in 1966 at an average level of 11·6 oz per head, per week. Butter accounted for about half the quantity of fats bought, and its consumption has been fairly steady at close on 6 oz per person per week since the introduction of the import quota arrangements in 1962.

Total liquid milk consumption at 4·93 pints in 1966 was a little greater than it was in 1965 (4·85 pints), mainly by reason of the changed age structure of the population—less school milk, but some rise in the demand for welfare milk. Cream, on the other hand, is well up in the food charts, with 25 per cent of households buying an average of 7½ oz per buying household in any one week. And we are eating rather more natural cheese (3 oz per person per week) than we were in 1960; this is more than processed cheese has declined. As to our beverages, despite some increase in the purchase of instant coffee, we are still very much a nation of tea-drinkers (at 2·7 oz per person per week), but it is interesting to note that whilst the demand for tea is inelastic to changes in price and real income, instant coffee is highly susceptible to both.

In the important health sectors of fresh fruit and vegetables, which are naturally affected by seasonal variation in supply, consumption has for some years been maintained at a highly satisfactory level. The attraction towards quick-frozen peas and beans is, however, as with other convenience foods, becoming strongly marked, averaging in 1966 1·1 oz per person per week and gaining, it appears, at the expense of fresh peas and beans and the canned product. Between 1960 and 1966 purchases of quick-frozen peas in particular nearly doubled.

Regional differences

Regional differences in eating habits are of course much less pronounced today than they were. Nevertheless, some variations still exist, with London, consuming relatively large quantities of meat, poultry, green vegetables, fresh fruit but comparatively little bread and potatoes, taking a 5 per cent lead (37*s.* 10*d.* per head per week) over the national average in food expenditure. The lowest regional averages were recorded for the North Midlands and the South West (3 per cent below the national average), while the average for rural areas as a whole was 7 per cent lower than the national level.

Behind the figures given in this Report lies a wealth of potential study, to which, no doubt, sociologists, agriculturists and specialist interests in the food trade are already applying themselves. But what is abundantly clear to all is the high food standard which the average person in Britain continues to enjoy.

How best to manage soils and to maximize output are the complex problems which are the concern of the National Agricultural Advisory Service

Soil Science in the Advisory Service

D. B. Davies

FEW industries have such a variable and often difficult raw material to work with as British agriculture in the soils covering this country. Some of the good soils of Britain were naturally fertile but most of them had low natural fertility and have been brought to their present condition of high productivity by treatment and management. There are many large tracts of land where soil conditions limit land use and a higher investment of capital and effort is needed to maintain production. The successful farmer must learn to understand his soils and how to manage them to obtain a required output. It is the purpose of soil scientists in the N.A.A.S. to help him to obtain this more efficiently.

Range of work and training

The range of subjects covered by soil advisers is numerous, making their field of activities wider than for other science specialists in the Service. Their major interests are water and nutrients in the soil, plant nutrition, fertilizers, organic manures and liming materials, soil management and the effects of soil conditions on crops, as well as a number of related subjects such as air pollution, water quality for irrigation and the detection and effects of pesticide residues on subsequent crops.

There are no University courses designed specifically to train soil advisers, but probably the most appropriate is a degree in Agricultural Sciences with an Honours Course in Soil Science. However, whether a new adviser takes this course or joins with a Science degree and postgraduate experience in soils, he needs a great deal of further training before he can make a useful contribution to agriculture. In recent years the need for intensive training within the Service has been better appreciated and much of the first two years of a new adviser's career is devoted to this end. Besides the obvious tasks of making good the gaps in knowledge, and gaining experience of problems of crops on a wide range of soils, the newcomer usually has to learn to apply his training to problems of significance to agriculture rather than to problems of academic interest with little immediate application. One means

of achieving this change in attitudes is for the new adviser to undertake a research project which has some definite advisory end in sight, and usually this type of investigation is included in each programme.

Responsibilities as an adviser

The soil adviser, besides his responsibility to keep abreast of new ideas and techniques in his subject, must constantly ask himself two questions, 'am I using my knowledge to its best value in advisory activities', and 'what problems require special investigation?'

He has then several complementary roles; first, there is the task of advising farmers either directly on farms, at meetings and by published articles, or indirectly through other advisers by means of advisory papers and by soil and plant samples sent in to him. Secondly, he must devote a proportion of his time to finding out about advances in his subject, because an out-of-touch specialist is worse than none at all! This aspect of his work is achieved by contacts with other advisers and research workers both at home and abroad, by reading the relevant scientific and agricultural literature, and by means of regular training and refresher courses throughout his career. Thirdly, he is an applied research worker who has to find answers to problems of general or local application, or to test the effect of known techniques under new conditions. Modern agriculture is a rapidly changing technology and problems come up thick and fast, so that usually it becomes a question of deciding on priorities and tackling the more important ones.

Two examples will give the reader an idea of the type of investigations that are undertaken. The first involves a range of conditions in soils which can be improved by deep tine cultivation (subsoiling). To find out if the beneficial effects of this treatment offset its cost, forty trials have been carried out in England and Wales on widely different soils and under widely different agricultural systems, from hill grazings to intensive arable farms. The photograph on page 54 shows one of these trials in progress on silt soils, where mixing of the profile was included as one of the treatments. Micro-nutrient deficiency work is another example of applied research which has played a substantial part in the programmes of several soil science departments. As a result of this work and advisory activities it is now known on what soil types in what parts of the country, and on which crops deficiencies such as manganese, boron, copper and molybdenum are likely to cause yield reduction. Reliable means of diagnosis both visual and analytical have been evolved, and, with the help of field trials, the most satisfactory remedies have been selected.

Depending on the problem and the success with which interest can be roused, in some cases the help of research workers in universities or research stations is sought. For instance, in the case of the micro-nutrient deficiency studies, much of the early work in this country was done by Professor T. Wallace and staff at Long Ashton Research Station.

Tools of the trade

The soil scientist relies on a number of techniques to help him in his studies; in the field a keen eye for detail and an expertise in soil examination is the first requirement, but for the nutrient status of soils he must have recourse to chemical analysis in the laboratory. These laboratories and the analysts who run them are an essential part of each soil department, and in addition

Trial in progress on thin fen peat

to facilities for routine soil analysis, plant analysis and micro-nutrient analysis, special laboratories have been built up in various regions. These include a spectrographic laboratory at Bristol, and at Cambridge there are radio-isotope and pesticide residue laboratories. Soil physics laboratories for the examination of soil structure and soil water characteristics are growing up in several regions to complement the field work on soil physical behaviour.

Replicated trial work and other field investigations are valuable tools which are much used by soil advisers. The initial planning for this type of work is done by the adviser himself, but most of the execution and recording is carried out by a team of assistants who are trained in this aspect of the department's work.

Scientific appraisal of the soil

The soil is a remarkably complex material exhibiting great variability, but the application of scientific methods and techniques, starting with the studies of de Saussure at the beginning of the nineteenth century, have gone far to explain the fundamentals of plant growth and the roles played in this by the soil. The soil adviser of today is first and foremost a field worker, who in his assessment of soils takes account not only of the top soil but of the whole soil profile. This attention to the profile as the soil unit rather than just the top soil in isolation, gives a much clearer indication of the potential fertility of soils and helps to explain many anomalies of plant growth and soil behaviour which cannot be explained from examination of the plough depth alone. Examination in the field, complemented by chemical analysis to discover the level of nutrients in the soil, enables the adviser to assess the limitations to crop growth which will or may occur on any type of soil and, in addition, he can indicate how best to improve the output from a soil where this is possible.

In the last thirty years agriculture in Britain has been revolutionized by the introduction of cheap supplies of chemical fertilizers. During this period, when nutrient deficiencies were widespread, soil analysis has been of great value in determining the lime and nutrient requirements of land, but now on much of our lowland agricultural areas well designed fertilizer programmes have been used and large residues of phosphate and potash have been built up.

In these circumstances routine soil analysis for phosphate and potash has ceased to play its former important role, although the determination of soil pH and lime requirement is as useful as ever. Where nutrients no longer restrict yield the attention of soil advisers is directed towards the improvement of the other major factor governing a soil's productive capacity, that is, its suitability as a rooting medium. This aspect of soil fertility, variously referred to as soil structure, soil condition or physical fertility, is one which if more widely recognized and regulated by farmers would help to give higher yields on many farms.

There are other reasons why the attention of soil advisers has been focussed on soil physical behaviour and of these, probably the most important is the steady reduction in grass acreage on our arable soils over the last twenty years. The effects of this have been twofold; first, the soil structure has been subjected to an even greater extent to the adverse effects of machinery and, secondly, the soil organic matter level has fallen with an equivalent deterioration in soil structure. In some soils this is of little significance but on our clay soils and those that are high in fine sand and silt, a highly-skilled cultivator is needed to avoid reductions in yield, and the risk of losses from bad weather, disease or defective management are greater than formerly. In the same way, the greater density of livestock on our intensive grass farms inevitably increases the problem of poaching, and ways and means of avoiding and reducing its effects have to be found.

Fortunately, adverse conditions in soils are in most cases visible to the experienced eye, for example, slow profile drainage produces characteristic colour patterns in the soil which are visible at any time of year, and soil compaction is seen as massive or platy structure and by its influence on roots. The soil specialist can identify problems of this type and suggest changes in management which will help to cure them and avoid their recurrence.

The reader may well query the complete separation of chemical fertility of soils from their physical condition and he would be right to do so, for in practice the two are inextricably bound up, and plants suffering from adverse soil conditions invariably show mineral deficiencies. A good example of this is the frequent occurrence of magnesium and nitrogen deficiency symptoms in plants wherever adverse soil conditions cause poor rooting.

Co-operation with other specialists

The biological factors in soil fertility have in the past received much less attention from advisers than chemical and physical aspects. To some extent this imbalance is justified both by the complexity of the biological component of soils and by the fact that excellent plants can be grown in sterile water or sand culture. However, in the field the biological constituent cannot be ignored; it plays a major role in the formation and maintenance of soil structure, and numerous soil pests and diseases make inroads into growers' profits. Important relationships between soil factors and the distribution and behaviour of soil pests, in particular eelworms, undoubtedly exist but so far this subject has been only scantily explored and remains a useful one for co-operation between advisory soil specialists and entomologists.

Looking to the future the present trends in agriculture of increased specialization, increased mechanization and reduced cultivation all have important repercussions on soil conditions and in this field soil advisers, working with both agricultural engineers and husbandry specialists, have a

useful role to play in predicting and demonstrating how these changes apply to different soil types and what the effects are likely to be under various conditions. What is right for one soil can be very wrong for another and a basic understanding of the soil is essential for an accurate forecast of results. Techniques for soil management must be worked out for a set of conditions and attempts to arrive at blanket methods for all soils and all conditions cannot succeed.

Undoubtedly the most difficult prediction that the agricultural scientist has to make is the accurate estimation of a plant's response to changes in environment whether these be brought about by disease, pests, weather, soil factors or management. Whereas, for instance, it is comparatively easy to measure the degree of compaction in a soil, to determine the extent of take-all infection on wheat roots growing in the soil and the number and type of weeds competing with the wheat, the difficulties of translating this information into an accurate prediction of yield depression are very complex. It is the quest for solutions to this type of problem that occupies much of the thought and energy of specialist advisers in the National Agricultural Advisory Service and demands that they co-operate with each other to an even greater extent.

This article has been contributed by **D. B. Davies, M.A., Ph.D.,** who is a Soil Science Adviser for the N.A.A.S. at Cambridge.

Ian Moore, *Principal of Seale-Hayne Agricultural College and his Deputy,* **John Halley,** *describe how the College farm was re-shaped to meet modern demands*

Re-shaping a Farm

RE-SHAPING a farm to meet the needs of mechanization and the exigencies of a changing economy in a highly technical age demands forethought of a high order. Moreover, farmers who are in a position to re-plan their farm carry a heavy responsibility to ensure that our rich heritage of a beautiful countryside is preserved for generations to come. The expediency of the day or the focus on low costs should not blind one to minimize this responsibility. By having regard for history and education and by making full use of the greater facilities this generation enjoys for travel, for inspecting the efforts

of others, coupled with the wide range of materials and designs now at our disposal, should ensure that the countryside of tomorrow will have lost none of its past charm and glory but will have acquired characteristics of its own.

Re-shaping a farm involves much more than mere building. The siting of the buildings is of supreme importance economically, functionally, and aesthetically. The beauty, shelter and soil conservation provided by well placed trees must be borne in mind. A design harmonizing with the landscape yet paying due heed to flexibility and to economy, as well as to simplicity of working, must be chosen. Materials which blend with the surroundings must also be selected. These considerations are of prime importance if we are to discharge our responsibilities to posterity, yet they permit no simple answer.

All the resources at the disposal of a farmer today in the shape of advisory services, especially with regard to work study, should be harnessed. The College farm at Seale-Hayne has been re-shaped in recent years to meet modern demands, and our experiences may be of some help to others similarly placed.

Twenty years ago the 400 acres comprising the College Estate were composed of 43 fields varying in size from 2 to 30 acres. The buildings, built to last for generations, were sited illogically in one far corner of the estate and were incapable of simple modification, so soundly were they constructed. Today, after removing two miles of Devon banks—so picturesque in springtime with their primroses and ferns but so labour-absorbing for maintenance—we have 33 fields rationalized for size to suit modern equipment, with a new range of buildings strategically sited in the heart of the estate. Fences have been straightened, small streams and ditches piped in, yet the beauty of the estate has been enhanced by massive planting of standard trees and in order to maintain an ecological balance. An avenue of deciduous trees of many varieties—for visual teaching purposes—has been planted through the centre of the farm and this takes the bulk of the traffic. Wet hollows have been afforested with poplars with an eye to the match and chip basket market in 20 years time. Unproductive, unploughable slopes have been planted with larch for fencing stakes whilst other areas are planted with Norway spruce to provide a sequence of Christmas trees. Nor has the need for windbreaks or for shade in summer been forgotten in our planting.

The land rises to 550 ft and a number of fields are too steep to plough with safety. Soil and climate combine to determine that grass is our dominant crop. This is utilized by dairy cows, beef cattle and sheep, the crop so far as possible being consumed *in situ*. After thoroughly trying out grass drying, silage-making and barn-cured hay as means of providing winter fodder, our experience has led to us to make silage the mainspring of the winter feeding programme. Ensilage lends itself to mechanization and self-feeding and is less dependent on ideal weather conditions.

Kale as a supplement to silage for winter feeding was grown for a number of years. This proved most satisfactory as such, but with high rainfall (39–40 in.) and an impervious soil the problem of poaching became so acute, and the physical condition of the cows (often belly deep in mud) so appalling in conjunction with the problem of infertility, that we have now discontinued growing it. About 2–3 acres of cauliflower (the College pioneered the breeding of many varieties grown in the South-west) are grown for seed, and the rest of the land not in grass is sown with cereals. This is not a cereal growing farm,

as can be readily appreciated, and as numbers in livestock can be built up, so the cereal acreage will be reduced.

The dairy herd

With the present price relationship between milk and meat, the dairy herd takes pride of place. On the basis of gross margin per acre neither beef nor sheep can compete with milk, but it is important to remember that, as with us, there are areas on many farms where cows cannot graze and cereals are quite impossible. Thus the ewe flock and the Devons justify themselves in economic terms as well as providing valuable teaching material. After all, the prime function of a college farm should be as a teaching tool.

South Devon cattle were kept until 1954 when they were replaced by a Guernsey herd. In the milk recording year 1966/67 the average yield reached 9,066 lb for a herd of 55. Since then we have been be-devilled by brucellosis and efforts to eradicate the disease have decimated the herd in spite of vaccinating all calves with S.19 vaccine throughout the life of the herd. Additional stock must now be purchased and inevitably the breed to be chosen is Friesian. From the point of view of teaching this is a useful development, for most students leaving college will be concerned with this breed which now predominates in this country. Moreover, the problems involved in striving to eradicate brucellosis—problems facing a considerable number of farmers today—have been of inestimable value from the purely teaching angle.

All the cows were milked in a standard shippon until 1954 when two self-feeding silage yards were constructed in the centre of the main grass area. The money for this development was provided by American Mutual Aid. A portable milking bail was used in conjunction with the yards which accommodated 30 cows. During the summer all cows were milked in the bail but in the winter half the herd had to return to the shippon.

This provided a useful comparison between the two systems of housing and milking. In 1962 a new tandem 6/3 parlour and loose housing building with self-feed yards was constructed to accommodate 60 cows. After two winters on loose housing, cubicles were installed. The principle advantage conferred by the last change was a saving in straw, for the cows were not noticeably cleaner.

Beef cattle

In 1958, the nucleus of a herd of Devon cattle was presented to the College and this has now been expanded to some 20 spring calving cows. In the early years, progeny not required for herd expansion or replacement were sold fat at approximately 20 months of age. This system provided a reasonably satisfactory gross margin per cow but a thoroughly unsatisfactory gross margin per acre. More recently, the cows and calves have been grazed intensively through the summer and the fattening cattle fed more generously in the winter so that they are fit to slaughter at approximately 15 months. This has improved the gross margin per acre, but the price for beef in relation to milk is still such that a suckler herd cannot compete in financial terms with a dairy herd. However, the two groups of cattle are not competing in physical terms as the beef cows graze land which is unsuitable for the dairy herd.

A proportion of the cows in the dairy herd have been crossed with Devon and Charolais bulls and their progeny taken through for slaughter at 15–18

months of age. The Charolais Cross has grown faster than the Devon Cross but it was thought unwise to use Charolais semen on Guernsey heifers. Dystokia has not been a problem with Guernsey cows inseminated with Charolais semen.

Sheep flock

Sheep numbers have increased over the period and their grazing management is integrated with that of the cattle. As with the beef herd so with the sheep flock—simple gross margin calculations compare unfavourably with the dairy herd. Once again, however, there is no direct competition for land. A number of experiments on separate intensive grazing techniques with the ewe flock have been completed, although the bulk of the ewe flock is not restricted to a small area of land during the grazing season. By careful management it is possible to maintain four ewes and their lambs per acre throughout the year without the complication of creep grazing.

The original flock of South Devon Longwools has very largely been replaced with more prolific, cross-bred ewes. The majority of the flock lamb in the early spring but an experimental group lamb in the autumn.

Pigs

So far as pigs are concerned expansion of the herd was checked by an outbreak of swine fever in 1959. When re-stocking, virus pneumonia-free gilts were purchased and the herd has remained free ever since. The progeny of some 50 sows are now taken to bacon weight, and the income from the pig enterprise has made a useful contribution throughout the period, despite unsatisfactory grading results, which can be attributed very largely to sows rearing a large number of pigs per year and the use of cheap food. Ultrasonic equipment is now used to improve grading in the selection of breeding stock.

Poultry

A poultry enterprise was run with considerable success until 1967 when circumstances presented a choice between the investment of a large capital sum for modernization or closing down the poultry enterprise. In view of the changes taking place in the poultry industry requiring an ever increasing degree of specialization it was decided, reluctantly, to adopt the latter alternative, there being more pressing needs for the money available. Poultry production is still part of the teaching syllabus for agricultural students but visits are arranged to large-scale poultry farms in place of the College unit.

Summing up

What does all this change amount to? A farm has been re-shaped to meet the modern demands of mechanization and flexibility of enterprise, and yet beauty and design have been retained, with the result that the new unit merges into the English landscape. All these changes have been effected in a manner which could be emulated by any farmer or landowner in the country. We have had no access to special financial resources. The farming system has been simplified and the rotation now followed is 4 years ley, 4 years cereals. As the productivity of the grassland has been increased by better seeds mixtures, optimum fertilizing and highly efficient utilization, so

stock numbers have increased to match this production. Land has been released for cash cropping with cereals. The profitable livestock enterprises have been expanded, more money has been invested in machinery, and the labour force has been reduced. A simple story no doubt, yet typifying with clarity the history of British agriculture over the past two decades.

This article has been contributed by **H. Ian Moore, C.B.E., M.Sc., Ph.D. (Leeds), N.D.A., Dip. Agric. Sci. (Cantab.)**, Principal of Seale-Hayne Agricultural College, Newton Abbot, Devon and his Deputy, **John Halley, M.Sc. (Reading), M.A. (Cantab.), Dip. Agric. (Reading).**

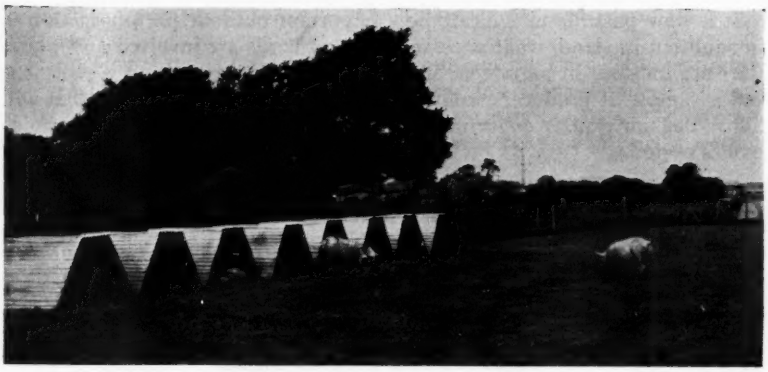
M. A. B. Boddington and **J. D. Sykes** of the Department of Agricultural Economics at Wye College discuss the pattern of outdoor pig keeping in southern England

Outdoor Pig Keeping

INTEREST in outdoor pig production has waxed and waned over the last decade. For a few years it appeared that this system would become of considerable importance in the country but in the early 1960s the interest declined and outdoor pigs began to look like a seven-days wonder. Today many regard it as a suitable method of production merely for those farmers with light enough and cheap enough land.

Whilst this may be true for pig keeping it is not necessarily so for intensive cereal farming. Here pigs may form a valuable break crop. Not only can they leave a return per acre which compares favourably with that for barley, and in many cases exceed it considerably, but they may well help to check the growth of expenditure on herbicides and fertilizers and arrest the downward trend in grain yields. Outdoor pigs certainly appear to warrant reappraisal on many farms now that margins from cereals are less favourable than six to eight years ago.

The Department of Agricultural Economics at Wye College, with the co-operation of the Department of Agricultural Economics at Reading University, is currently investigating the economics of outdoor pigs. The aim is to collect financial and physical information from a representative sample of farms in order to allow estimates to be made of the profitability of the system. Details of capital requirements, the seasonal labour demands, longevity of sows and feed requirements are needed, amongst other data,



Dry sow housing

for this purpose. Particular attention is being paid to the land requirements of outdoor pigs and to their influence on crop rotations and production. It is planned to study a selected number of farms in considerable detail. Some of the economic aspects of crop rotations are complex—the effect on the level of disease build-up, fertilizer requirements, weed infestation and subsequent crop yields—and it will be necessary to study them with computers and techniques such as linear programming.

About a year ago, at the start of the study, extremely little was known about the extent of outdoor pig production in this country. It was decided in the first place to limit the study to southern England, where soil and climatic conditions favour intensive cereal production and where soil conditions in general were thought to be conducive to outdoor pigs. Break crop alternatives, too, appeared less satisfactory here than in some areas, such as East Anglia, where vegetable cropping is more generally possible.

It was decided to concentrate, therefore, on twelve counties stretching from Dorset and Wiltshire in the west to Kent and Essex in the east. The area totals about 4·8 million acres of crops and grass, of which almost two-fifths is currently in cereals. It is also an area with a high pig population—a total of 147,000 sows in some 8,000 herds. This is 22 per cent of the sows and 13 per cent of the herds in England and Wales.

The average size of pig herds in the counties concerned is nearly 60 per cent larger than the national average—18·5 sows as compared with 11·8 sows per breeding herd. According to the census returns for 1966 about two-thirds of the sows and gilts in England and Wales were in herds of over fifteen. To establish the extent of outdoor pig production it was therefore decided to conduct a postal survey of a representative sample of herds with more than fifteen sows and gilts in southern England. The assumption was that these herds were commercially, if not numerically, most important.

Approximately 900 pig breeders were circulated, or one in three of the farmers with more than fifteen sows in the counties concerned. The response was remarkably good both in respect of the number of replies and the information supplied. The authors would like to thank producers for their most helpful co-operation in returning completed questionnaires. Altogether replies were received from 80 per cent of the producers circulated and in some counties the response rate was as high as 90 per cent.

It is now possible to indicate how important outdoor pig production is in southern England, what sizes and types of herds are involved and where they are located. In particular, it has been possible to contact a representative sample of producers willing to provide further information that will allow the universities concerned to study the economics of outdoor pigs over a period.

Principal findings from postal questionnaires

The survey showed that just over 7 per cent of all herds with sows and litters were permanently run out of doors but there is considerable variation across southern England.

The details are as follows:

Table 1 **Outdoor sow herds in southern England**
(Herds with 15 or more sows)

	Outdoors			Outdoors	
	All year	Part year		All year	Part year
	%	%		%	%
Dorset	15	33	Bucks.	7	27
Berkshire	12	27	Surrey	7	20
Hants. and I.O.W.	11	23	E. Sussex	4	20
W. Sussex	11	18	Kent	2	15
Oxfordshire	10	35	Essex	2	21
Wiltshire	7	33	All areas	7	24

From these findings it is estimated that, in round figures, 14,000 sows in 250 herds, or 10 per cent of all sows in the counties concerned, are permanently kept outside.

There is a well defined tendency for the proportion of outdoor herds to decline the further east one travels, but this tendency is far stronger for herds kept wholly outside than for those kept out for part of the year only. This difference may be attributed to the fact that soil and weather conditions are less important for producers who put their sows outside in the summer only than for those who have them out all the year.

A study of herd size shows that the average number of sows and gilts in herds kept outdoors all the year is seventy-one compared with fifty for herds kept indoors all the year. In turn, the latter are larger than those kept

A row of farrowing huts with runs which may be opened at the front

outside for only part of the year, which have an average size of forty-two sows and gilts.

The principal type of pig produced by outdoor pig farmers is, of course, 'weaners'. This is followed by 'stores'. Very few farmers indeed attempt to fatten their pigs out of doors; only five farmers out of 625 producers contacted are fattening out of doors all the year round and only three put fatteners out for part of the year.

Table 2 **Types of pig sold by outdoor and indoor producers**
(Sows and litters)

	Outdoors All year %	Outdoors Part year %	Indoors All year %
Weaners	44	33	32
Stores	20	5	7
Porkers	12	37	36
Cutters	6	5	6
Baconers	6	9	12
Heavy hogs	12	11	7
	100	100	100

Outdoor producers sell a higher than usual proportion of heavy hogs, possibly since most herds are based on Saddlebacks. It is noteworthy that there is a substantial demand from heavy hog producers for weaners and stores reared out of doors.

Apart from indicating what numbers and types of pigs were produced outside, producers also provided information on their systems of production. It is clear from the wide range of systems described that there are almost as many methods of outdoor pig keeping as there are farmers practising them. The length of time during the year in which pigs are kept out of doors differs considerably, from a strict round-the-year routine to those who put their sows and litters out for a few months during the summer only or when the weather is fine. About three-fifths of the herds farrow indoors and the sows and litters are moved to outside arks between three days and three weeks later. The remainder farrow outside and their little pigs are left out until weaned. Most pigs are still weaned at eight weeks but rather more than 20 per cent are weaned at five weeks.

Grazing systems vary from a small run attached to the front of the ark, which is moved frequently, through paddocks to free range. Some farmers use the same field every year and others adopt an annual rotational system for moving their pigs around their farms.

In the same way as variations were found in the system of outdoor pig production, so too was there a wide range in the reasons given for selecting such a system. These were numerous, but the predominant reasons were as follows:

1. to use small permanent pasture paddocks and orchards (39%)
2. to produce stronger, healthier stores or weaners (22%)
3. to provide a break for cereals or other crops (18%)
4. to rest farrowing accommodation (10%)
5. to minimize the amount of capital tied up in buildings (6%)
6. to save labour (5%)

The second reason is usually one which follows rather than promotes outdoor pig keeping. Having decided to keep pigs outdoors for one reason

or another, it becomes evident that a strong store pig is produced, for which there is a useful market demand.

Pigs as a break crop

We are particularly interested in the place of pigs as a break crop. Some sixty to sixty-five farmers have agreed to co-operate in the study which is mainly concerned with this matter. They are providing detailed records of production, inputs and land use, etc.

Cereal production in the counties of Dorset, Wiltshire, Hampshire, Oxfordshire and West Sussex, mostly on chalkland, has presented considerable difficulties in recent years, due to soil-borne pests and diseases and to weeds such as couch grass and wild oats. Yields which were comparatively high have fallen appreciably. Unfortunately this has coincided with declining prices. At some stage, however, an equilibrium level of yield is reached where 'disease tolerance' occurs. It then remains at that level or possibly rises again in some degree. In many cases the equilibrium has been at a poor or unacceptable economic level, hence the urgent search for a break crop which could be integrated with the farming system. Crops such as oilseed rape and field beans have been quite extensively grown over the last few years. These crops, however, provide only a partial solution; each has its own particular drawbacks for the predominantly cereal farmer.

The 'Roadnight' system of pig production has been used by some farmers to fill the break crop gap. Among the advantages which commend it to cereal farmers are the following:

1. it is relatively economical on capital
2. labour requirements are fairly even throughout the year
3. it produces a gross margin as high as, or higher than, cereals
4. it adds to soil fertility
5. there is a rest from cereals and a measure of cereal disease control is thereby achieved
6. pigs are very effective eradicators of couch grass

Although details are not yet available regarding profitability, some producers suggest that returns can be very satisfactory. In addition, considerable claims are made for increased cereal yields after pigs.

Apart from its place as a cereal break, outdoor pigs are found on horticultural holdings where they form a break between such crops as cabbages, cauliflowers, Brussels sprouts, broccoli and lettuces. There is an added advantage that the pigs can be fed much less other feed where there are crop residues available for eating off.

Disadvantages of outdoor pigs

Outdoor pigs are not without their drawbacks, whether they are kept for break crop purposes or not. Whilst little pigs are generally healthier, soil eating can become a problem and some producers report intestinal irritations in their pigs, even to the extent of inverted bowels. In wet weather mud can be a great problem except on the lightest land. Food loss also occurs through incorporation with the soil or through depredation by birds. Some pigs show little respect for electric fencing and stout pig fencing must be erected. Likewise, the job of moving fences and huts can be quite considerable. In some areas foxes may take numbers of little pigs. On outlying

land the job of feeding, inspection and supervision may be a burden, especially at farrowing time.

Conclusion

Clearly, the place of outdoor pigs in the farm economy is an important one. They can provide a directly remunerative break crop, conserve capital and economize on labour use. As a source of healthy pigs for fattening, too, they deserve some attention. It is important to record the range of farm performance to enable a proper appraisal to be made of the economic significance of these various factors.

These remarks apply predominantly to the farmer whose sows and litters are outside all the year. The producer with pigs outdoors for part of the year falls between two stools; his herd tends to be smaller and he produces more than one end product, and he has capital tied up in both inside and outside accommodation.

From the information gathered by the postal survey it has become apparent that herds which are outside all the year are the most vibrant and it is these we shall have to watch.

This article has been contributed by **M. A. B. Boddington, B.Sc. (Agric.), N.D.A.,** and **J. D. Sykes, B.Sc., N.D.A., Dip. Agric. Econ.,** Wye College (University of London), Ashford, Kent.

A future for maize in Britain?

Good progress is being made in getting a good early-ripening variety of maize, resistant to cold and so opening up the possibility of the crop being grown successfully over wider areas. Since the 1950s the National Institute of Agricultural Botany has been well to the fore in investigating the many problems (such as varietal performance, plant density, time of sowing and harvesting) associated with maize production in this country, both for silage and grain. Tests made on maize at Cambridge have shown little difference in digestibility between varieties, but the early sorts are distinguished by a higher content of dry matter—averaging around 20 per cent. The crude protein content comes out at 9–11 per cent, and fibre around 23 per cent. Digestibility averages 70–75 per cent.

Currently the work of the N.I.A.B. has been concentrated on the evaluation of varieties. Those for silage are being grown at five or six centres, and grain varieties at three or four centres. In 1968 there were 47 varieties undergoing silage trials and 28 in grain trials. Since 1960 as many as 300 silage varieties and 90 grain varieties have been included in trials.

Sweet corn, for which the public palate is showing increased interest nowadays, has been the subject of variety trials during the years 1954–57, and again in 1967. Last year twelve varieties were under trials at five centres.

With such encouraging progress being reported from Cambridge and its allied trial centres, plus the fact that maize makes a very good cereal break, it is possible that we may, in due course, see maize grown considerably more widely in Britain than at present.

Once-a-Day Feeding of Calves

G. F. Francis

THIS article describes how a commercial barley-beef producer has very successfully adopted a once-a-day feeding routine for calves. This has resulted in economy of labour, reduced losses from deaths and unthrifty calves and, therefore, increased profits. The report covers the rearing of nearly 200 calves of various dairy and beef-dairy crosses between the 1st May, 1967, and the 31st July, 1968.

Past experience has established a number of principles which have become the basis of good calf husbandry:

1. Colostrum is essential for the newly-born calf for at least the first four days.
2. Ideal feeding routine should be little and often. Very young calves benefit by being fed three times daily.
3. Any changes in feeding should be made gradually.
4. Individual housing (especially for bought-in calves) for the first month or six weeks is highly desirable. Pens should be draught-free with a warm, dry bed.

New systems

Many alternative systems of calf-rearing have been suggested, including early weaning, rearing on cold milk and once-a-day liquid feeding. Commercial livestock producers and rearers are not always receptive to these new ideas, and are inclined to treat them with some suspicion. New systems of rearing young stock, which have in the past proved entirely successful on research or experimental farms, have not always proved so when subject to the less exacting practices of commercial production. For example, the 'early weaning' of piglets has proved hazardous on the commercial farm. Piglets produced by hysterectomy to form minimal disease or specific pathogen-free herds, although in theory a most desirable objective, have not progressed to the extent forecast, mainly due to the high costs involved. Similarly, the original recommendations for the production of barley-beef had to be modified quite considerably on commercial farms and there are many other similar examples. When a system such as once-a-

day feeding of calves proves so successful in commercial practice, it deserves to be well publicized. The routine was demonstrated at the 1968 East of England Show 'Beef Systems Exhibit' at Peterborough.

When visiting Long Lane Farm, Hemingford Grey, Huntingdon (Messrs. Ashmore Bros.) about eighteen months ago, it was observed that the calves and young stock forming part of the intensive beef enterprise were in excellent condition. A high proportion of the calves were Hereford x Ayrshire and these animals were producing finished barley beef in under 12 months. Mr. Michael Ashmore readily agreed to co-operate in an observation study covering a period of 12 months so that all aspects of the system could be explored and reported. The study started on 1st May, 1967 and was completed at the end of July, 1968.

Housing

The first basic requirement is that healthy calves (both male and female) be purchased only from local breeders. Arrangements are made with the breeder that the calves remain on their dams for four days before collection by Mr. Ashmore in his own transport. On arrival at Long Lane Farm the calves are placed in individual pens (see photograph on page 69). These pens have been adapted from two completely separate disused single-range cowsheds. Each pair of pens is provided with an infra-red lamp for use as and when required. The pens are thoroughly cleansed and disinfected between each batch of calves. One complete range is left empty for a minimum of fourteen days between each rear. The pens are approximately 5 ft by 4 ft and the calves are bedded on straw which is built up during the animal's stay in its pen—a period of five weeks.

Feeding

The calves are fed with a proprietary high fat milk substitute and calf weaner pellets according to the following feeding programme:

First day	No food is offered until the morning after collection
Second day	8 oz glucose, 2 oz milk powder, 3 pints water
Third day	6 oz glucose, 4 oz milk powder, 3 pints water
Fourth day	4 oz glucose, 6 oz milk powder, 3 pints water
Fifth day	2 oz glucose, 8 oz milk powder, 4 pints water
Sixth day	10 oz milk powder, 4 pints water
Seventh day	12 oz milk powder, 4 pints water

It will be observed that the glucose has been reduced by 2 oz per day from the initial ration of 8 oz and the milk powder increased from 2 oz to a maximum of 12 oz by adding 2 oz per day up to the seventh day. This quantity is continued until abrupt weaning at five weeks. The milk substitute is fed regularly at the *same time* but only *once a day*. Clean water and first-class hay are constantly available. To ensure that the water is always clean, the same bucket is used (after thorough cleansing) for feeding the milk substitute. A fresh supply of water is then provided. Calf weaner pellets are offered after the second or third day, and at the five-week stage, consumption averages 3 lb per day per calf.

The quantity of feed fed to each calf varied only slightly. The following figures refer to 90 calves up to the age of five weeks for which individual food records were kept:

Glucose 20 oz, high fat calf meal 25 lb and calf weaner pellets 48 lb.

A typical Friesian steer ready for slaughter scaling 924 lb live weight at 327 days

During the period, 178 calves were reared, but the individual food records were discontinued because the quantities fed were almost always identical. Liveweight records of each calf were taken at delivery (four days), at weaning (five weeks) and at the 12-week stage, the normal recognized age of a dry weaned calf. The calves were obtained from two local dairy farms and the particulars are as follows:

Breed or cross	No. of steers	No. of heifers	Total calves	Live weight on arrival	Live weight at 5 weeks	Live weight at 12 weeks
Hereford x Ayrshire	32	31	63	90	132	232
Friesian	59	2	61	96	141	249
Hereford x Friesian	21	33	54	81	119	220
				Average	Average	Average
Totals	112	66	178	89 lb	131 lb	234 lb

It is interesting to observe that the average weight of the Friesian calves at four days was some 15 lb heavier than the Hereford x Friesian calves. All the Hereford x Friesian calves were out of heifers. The dams of the Hereford x Ayrshire calves were well-grown mature cows.

At abrupt weaning (five weeks) the calves were transferred to follow-on pens where they continued on calf weaner pellets, hay and water. This building consists of eight pens 15 ft by 10 ft 6 in., each pen being suitable for eight calves until sixteen weeks of age. This average consumption of concentrates 5–12 weeks worked out at 6 lb per day. At four months, the calves are transferred to covered yards and subsequently to semi-open yards where they remain on a conventional barley-beef system until slaughter. A typical finished Friesian steer is shown in the photograph above. This animal scaled 924 lb live weight at 327 days, which resulted in a live weight gain of 2·82 lb per day (including calf birth weight).

The lightest calf weighed 62 lb at four days and scaled 196 lb at twelve weeks, whereas the heaviest calf on delivery scaled 140 lb and weighed exactly 3 cwt at twelve weeks of age. This indicates that a well-formed calf at birth which suffers no set-backs during rearing will generally prove a more profitable proposition than its lighter fellow. Other things being equal, a high live weight gain usually indicates efficient food conversion right through to slaughter. Any calf intended for beef should have a reasonable spring of rib and every effort should be made to retain the calf flesh.

Health record

Of the 178 calves reared during the study, only one died. This was a Hereford x Friesian steer which weighed 76 lb on delivery and died at nineteen days old; it did not respond to treatment for scours, a condition which was noted on delivery. In general, the health record was, therefore, excellent. Any other occasional sickly or scouring calf quickly responded to antibiotic treatment. This underlines the adequacy of the routine precautionary measures described. Frequent visits to Long Lane Farm satisfied me that the calves were always healthy, comfortable and thriving. In nearly every case they were drinking on their own by the third day. There were no calf sucking problems. The installation of electro-chemical fly killers has proved most effective.

Costs	£	*s*	*d*
Average price of calf at 4 days old	13	0	0
Food to 5 weeks			
Glucose 20 oz at £6 per cwt		1	4
High fat calf meal 25 lb at £7 per cwt	1	3	0
Calf weaner pellets 48 lb at £2 2*s*. per cwt		18	0
	2	2	4
Food 5–12 weeks			
Calf weaner pellets 294 lb at £2 2*s*. per cwt	5	10	3
Miscellaneous costs 4 days to 12 weeks			
Hay 14 lb at £12 per ton		1	6
Bedding straw 4 bales per calf at 2*s*. per bale		8	0
Labour	1	15	0
Veterinary surgeon and medicines		4	0
Housing and electricity*		10	0
	2	18	6
	£23	11	1

*Except for the new follow-on house, the rearing premises were adapted existing buildings which had already been 'written off'.

Cowshed at Long Lane Farm converted to calf pens
note inexpensive roof insulation, drainage and outside feeding buckets

Weaned calves of mixed sexes on dry feed at three months old cost about £28 each. Thus, the calf rearing enterprise, in its own right, shows a useful profit.

Summary

This observation study shows quite clearly that from a total of 178 calves reared to the three-month stage, the system described proved completely satisfactory for calves of mixed sexes and breeding to supply an intensive beef unit. There is no reason to believe that the same system would not also be satisfactory for rearing dairy heifers to the three-month stage. The main husbandry precautions are:

1. Individual calves should be collected in the rearer's transport from the breeder's premises at not less than four days old after having received the dam's colostrum.
2. Calves should be housed individually up to the five-week stage.
3. The pens should be thoroughly cleansed and disinfected and remain empty for at least a fortnight between each rear.
4. The once-a-day feeding routine should be carried out at the same time each day. (This halves the labour cost of feeding, which may be fitted in at any time of the day, once the time is fixed, to suit the running of the farm as a whole.)
5. Clean fresh water and first-class hay should always be available and all utensils thoroughly cleaned daily.
6. Weaning from liquid milk substitute at the five-week stage should be abrupt.
7. As with all forms of livestock husbandry, the well-being of each calf should be studied at least twice a day.
8. Stale food should never be allowed to accumulate.

G. F. Francis, Dip.Agric. (Leeds), N.D.A., N.D.D., is a Livestock Husbandry Adviser with the N.A.A.S. in Bedfordshire and Huntingdonshire. He has had many years' practical experience in connection with the rearing of young stock.

BRITISH CROP PROTECTION COUNCIL

A Symposium

Road Verges: Their Function and Management

Friday, 14th March, 1969

Assembly Suite of the Royal Commonwealth Society, London

Coffee 10.30 a.m.

Morning theme:

Verges and the Countryside.

Speakers from the Institute of Landscape Architects, Society for the Promotion of Nature Reserves, the Nature Conservancy, Weed Research Organisation and the farming community. Followed by a discussion.

Lunch 1.00 p.m.

Afternoon theme:

Verges and the Highway.

Speakers from the County Surveyor's Society, University of Bristol and the Nature Conservancy. Followed by a discussion.

Further information from: W. F. P. Bishop, Esq., 140 Bensham Lane, Thornton Heath, Surrey, CR4 7YU. Tel: Thornton Heath 2973.

'On the other hand . . .'

The present uses of some war-time airfields

W. J. Kinghorn

THE land area of England and Wales is about 37 million acres. Including rough grazing this figure contains not more than 29 million acres of agricultural land.

Between 1900 and 1960 the area of 'urbanized' land in England and Wales, as a percentage of the total land area, doubled from 5·4 to 10·8 per cent; this points to a further and significant loss by the turn of the century but possibly at a slower pace.

Urbanized agricultural land seldom reverts to its previous use, which emphasizes the need for the careful husbanding of this diminishing and irreplaceable resource and for budgeting almost as a miser its disposition amongst non-agricultural competitors. Many recent events—including the Countryside Act of 1968—focus widespread awareness on this problem.

On 14th June, 1968 Mr. John Mackie, Joint Parliamentary Secretary to the Ministry of Agriculture, Fisheries and Food, gave the following reply to a Parliamentary Question:

> 'The estimated losses of agricultural land in England and Wales for development of all kinds, including afforestation, were as follows:
> 1962–63 . . 38,659 acres; 1963–64 . . 53,909 acres; 1964–65 . . 49,218 acres; 1965–66 . . 65,726 acres; 1966–67 . . 38,034 acres.
> Because of the difficulty of determining in many cases the precise point in time at which land goes out of agricultural use, the allocation of figures to individual years is necessarily approximate.'

In November, 1967, in his Presidential address to the Royal Institution of Chartered Surveyors, Mr. Brian Eve[1] spoke with concern at the continuous urbanization of good agricultural land. He based his anxiety on a demographic projection that population (presumably excluding immigration but not the Pill) in England and Wales would, by the year 2000, increase by 17 million. Assuming that by then the population reaches say, 68 million people, the consequences of a diminished acreage of agricultural land are apparent for all to see.

In a paper published in 'Urban Studies' (February, 1968)[2] Dr. Robin Best, of Wye College, calculated that on average in Scotland, England and Wales, the annual post-war disappearance of agricultural land to all urban usages is about 44,000 acres; this figure, it is stated, does not include land transferred to forestry.

Another authoritative, erudite and wide-ranging contribution about our neo-Malthusian dilemma was an address recently delivered by Lord Holford[3] to the Centenary Conference of the Royal Institution of Chartered Surveyors.

In the 1930s at their peak, nationally unplanned, *laissez-faire* ribbon developments and the amoebic sprawl of 'suburbiae' consumed some 59,000 acres of agricultural land.

Service departments during the same decade and part of the next were, for good and patriotic reasons, voracious, though to some extent temporary, consumers of agricultural land. For example, between 1935 and 1940 the acreage of land occupied by the Air Ministry for the Royal Air Force, and for defence and ancillary purposes, increased by some 80,000 acres; by 1945 the increase was 306,600 acres. Other defence establishments added to this figure; admittedly not all was lost to agriculture. Parts of some airfields grew agricultural and horticultural crops, produced grass for drying and even pigs for sale.

On the other hand, some land that went, and still goes, out of agriculture, returns to its former use, for example, land is restored to agriculture and forestry after opencast coal and ironstone mining, and even "Beechinged" railway tracks have made some contribution. Modern farming techniques and mechanization, including the improvement of hill land, have increased production per acre and so in their own way have added the equivalent of new acres, but the major transfusers have been the Defence Departments.

Between 1945 and 1967 the Air Ministry (and latterly the Ministry of Defence) relinquished possession and occupation by sale, derequisition or transfer to other departments, including the former Agricultural Land Commission and the Ministry of Agriculture, Fisheries and Food, approximately 219,000 acres of land varying from assorted buildings and gigantic hangers to modest nissen huts, all in various stages of usefulness or dilapidation. In the same period the Royal Navy and Army also contributed, but to a lesser degree, some redundant airfields.

These airfields varied in extent from under 200 acres to over 600 acres. Some emergency fields had grass runways, relatively few buildings and not much in the way of other fixed equipment; others had massive reinforced concrete or tarmac runways, dispersal points capable of carrying the heaviest bombers, underground bunkers and stores as well as vast agglomerations of buildings of every description. Some airfields were constructed on land of low agricultural potential; for example, heavy land which was either not drained at all or very difficult to drain, but some land taken was highly productive and capable of growing above average yields of diversified agricultural crops; consequently, the restoration to agriculture over the years varied between airfields both as regards degree, time taken and costs, whether to private enterprise or to government departments.

Recently the Agricultural Land Service reviewed the present uses of some 160 former R.A.F. airfields in England and Wales; these are spectacular and, to say the least, highly diversified. Restoration to agriculture (partially or

wholly), including horticulture and intensive production of livestock, is far (and gratifyingly so in view of what has been written above) in the lead with 130 examples. The catalogue of diversification is quite astonishing. A random sample (with the number of examples in brackets) includes driving schools (2), Go Kart and motor cycle racing (16), a car factory (1), forestry (3), private flying (3), industrial sites (9) (including Martlesham in Suffolk where the Christmas decorations for London's Oxford and Regent Streets are made), civil airfields (4), laboratories (1), vehicle testing (5), sand and gravel extraction (4), model aeroplane clubs (1), police dog training centres (1), egg packing stations (2), caravan sites (3), local authority housing estates (5), turf (agricultural!) sales (1), gliding (4), agricultural show grounds (2), radar stations (1), and Borstal Institutions (1), and the list is not exhaustive; in fact, many ex-airfields have more than one use; the record seems to be held by one in Wales which boasts of some land in agriculture, hangers and surrounding hard standing let for miscellaneous storage purposes, Go Kart and motor cycle racing complete with grandstand for spectators, a model aeroplane club and the training of police tracker dogs. One industrial site (in Suffolk) produces building and insulation boards from surplus straw purchased from the surrounding arable areas where few livestock are now kept on this kind of litter; this factory integrates industrial and rural life by its commercial activities. It employs a number of local people displaced by mechanization and increased productivity of agriculture.

These non-agricultural activities on disused airfields have often been on sites that could not, or only at exorbitant cost, be restored to agriculture but they have in fact meant, nationally speaking, a net saving of good agricultural land. Obviously restoration of some airfields to agriculture was both expensive and difficult. In some cases there was the human problem of getting possession of buildings occupied by squatters for whom suitable alternative accommodation could not readily be found. In other cases the high cost of agricultural under-drainage and engineering difficulties in connecting up, or of not connecting up, new drainage systems with existing ones on the airfield, which more often than not were defunct or obstructed, was a major problem. On the larger airfields agriculturally redundant concrete or tarmac runways and dispersal points, buildings in poor condition or the foundations of others which had been sold off, rusting barbed wire (a menace to the stomachs of sheep and cattle), pests, overgrown scrub and weeds, were a disincentive to restoration, and even now, after so many years, the landscape in some areas is still blighted by the unsightly decaying relics of former airfields.

Where the airfields lay within economic distances of development areas it has been possible to excavate the hardcore from the runways and dispersal points and to sell it at a profit to developers. Moreover, some runways are being used as access roads to the restored agricultural land; as storage spaces for straw, hay and sugar beet; as hard core for farm roads and, in some cases, actually restored to agriculture after being excavated and in-filled by topsoil. Some buildings are used for agricultural storage of such things as fodder, crops and fertilizers, and some suitably modified for the housing of livestock.

The present contribution to the 'other hand' of airfields and other service land redundant to defence requirements has, of course, greatly declined compared with the immediate post-war years, but many high-yielding acres of crops and productive grassland are (if one may be allowed to be imagina-

tive) to the present occupiers what 'per ardua ad astra' was to their heroic predecessors.

Acknowledgement

I wish to thank my colleagues in the Agricultural Land Service who gave me considerable help in the preparation of this article

This article has been contributed by **W. J. Kinghorn, M.A., B.Sc.(Hons.) Agric., F.L.A.S.**, a Land Commissioner with the Headquarters of the Agricultural Land Service of the Ministry of Agriculture, Fisheries and Food, London.

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Film for sheep men

A NEW film, *A Tale of Four Shepherds*, made for I.C.I. comes appositely at a time when the profitability of keeping sheep in Britain is one of the more contentious subjects in farming circles. The film, which covers the year round, is noteworthy inasmuch as the locale of each of four widely separated but traditional areas has been carefully chosen: these are Perthshire, N. Wales, Yorkshire and the Romney Marshes. What emerges and makes this film one which sheep farmers and their shepherds should make a point of seeing is the emphasis it places on the use of modern methods of sheep husbandry.

Mr. Neil McCall Smith, who farms 2,000 acres at Crieff, Perthshire, breeds for twins on the hill. He feeds for milk until six weeks after lambing, when the lambs are daily shed off their mothers on to reserved young grass and feeding hoppers, returning to the ewes at night. On her 3,000 acre mountain farm at Capel Curig, Mrs. Esme Kirby has overcome a liver fluke problem on the lower ground by digging channels to take off most of the water and a regular dosing routine in the danger months September–April. Mr. David Fattorini's farm at Wetherby in the West Riding is mainly dairy and arable, with sheep forming only one of a number of enterprises. Grazing during the winter is restricted so as to avoid puddling the ground, and the idea of inwintering is not one to which he subscribes wholeheartedly. Not so Mr. R. Regendanz, who stocks heavily on 160 acres at Iden in East Sussex. He is keen to try out the less familiar breeds (the film shows Finnish Landrace and Oldenburg) and by keeping careful records he can take full advantage of judicious selection and improvement.

The film (16 mm) runs for 45 minutes and may be borrowed without charge from I.C.I. Film Library, Millbank, London, S.W.1.

Performance Testing of Welsh Mountain Rams

Gwynn L. Williams
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ONE of the fashionable terms of present-day farming jargon is performance testing. It is used in connection with improvement schemes for pigs, beef cattle and sheep and should refer to the *measured performance* of potential sires kept *under standard or common systems of management*. The Pig Industry Development Association and Beef Recording Association schemes for pigs and beef bulls are fairly well known by now.

Why do it?

Keen breeders might well ask (and are asking) why they should bother to performance test their rams—surely they can select the 'best' animal by eye and handle? These questions are very relevant, for the hand, eye and a good memory have been the tools of breeders who have, without doubt, altered the standards of their flocks. Improvement of economic characters is at the best a slow job; annual gains are small and differences of a few pounds in body weight, or even in fleece weight, are not always apparent to the eye. Years ago we found that culling on actual fleece weight was 30 per cent more effective than visual selection in raising average fleece weight of a flock.

Measurement of performance offers the breeder a far greater degree of precision when selecting breeding stocks.

Two important attributes of Welsh Mountain sheep that can be measured are body weight (size) and fleece weight. Within the limits imposed by nutrition and climate one attempts to increase the average weight of ewes and lambs in a flock as well as the weight of the fleece. Individual breeders, particularly today, may attach more importance to the size of the sheep than to wool, but personally I continue to believe that it is economically desirable to breed for heavier (but not longer) fleeces in our mountain sheep.

Fortunately, both body weight at 1½ years of age, or older, and fleece weight are highly inherited in Welsh sheep so that mass selection (selecting on the animal's own performance) within a flock for either or both of these traits should result in effective improvement. Lest someone should think that hardiness has been overlooked, this adaptive or fitness characteristic should be safeguarded by the fact that all breeding stock are reared under natural hill conditions.

Many of the hill flocks in Wales are not large enough to breed all their ram replacements without risking in-breeding effects, hence rams are bought-in. Special sales of rams conforming to current standards of type are organized by County Associations of Flockmasters in five North Wales counties. However, as in all sales, variation occurs in size, condition, wool growth, etc. between rams from different flocks, largely because they are kept and managed differently. Prize winners or the 'best' rams often prove to be disappointing breeders, possibly because their apparent superiority reflected the artistic ability of their handlers.

How to secure rams with a reasonable chance of improving our sheep is an annual problem to us and most farmers. The provision of a (limited) supply of rams of known performance under a common system of management would go a long way towards meeting our requirements.

How it works

What follows is an account of a unique scheme in existence in North Wales to performance test Welsh Mountain rams. Everything hinges around the ability of hill sheep farmers to *co-operate* with each other for the common good.

County Associations of Flockmasters were formed about twenty years ago to foster sheep improvement and a close and happy relationship has always existed between them, this College and the Livestock Advisers of the National Agricultural Advisory Service. Early in the summer of 1965 discussions were held at county level to see whether performance testing schemes could be organized for ram lambs born that year. We attach a good deal of importance to the fact that the scheme was initially, and is still, discussed with the breeders themselves at the grass roots level and not through second-hand channels.

The proposal was to graze April-born ram lambs, from as many flocks as possible together over the eight months period from the beginning of October until the end of May. Hill ram lambs are often sent away for wintering until April so the test period was only two months longer to enable the rams to be shorn before returning home. This was to be a post-weaning test and should not be confused with the limited tests at earlier ages conducted with Down ram lambs elsewhere.

The response to the scheme was, as expected, extremely good and the first task was to obtain grazing or 'long wintering' for rams from each of the five counties. This was not an easy task, for few lowland farmers are keen to winter ram lambs and most people wish to be free from sheep after the beginning of April. However, each county managed to find grazing, either on a headage basis or on a 364-day tenancy. We were very fortunate in that Mr. E. L. Jones, Regional Livestock Adviser, Wales, who, like his colleagues in the counties, has his heart and soul in this business, was able to obtain the support of the N.A.A.S. Welsh Regional Experiments Committee.

The result was that 249 ram lambs from some 130 flocks were tested between the five county centres in 1965/66. Rams coming on test were deliberately not selected for a standard type and each breeder was allowed to choose his own animals. Body weights were recorded regularly throughout the eight-months period with different groups of breeders assisting the livestock adviser each time. Wool growth was also measured on an area of one inch square on the right mid side since the sheep were not shorn at the beginning of the test. Rams were vaccinated against braxy, blackleg and enterotoxaemia, injected with vitamin D, dosed against worms and run regularly through formalin.

At the end of May all rams were shorn at public field days, akin to those held by Coke at Holkam. The fleeces were weighed and graded by Mr. E. Hanson, Regional Officer of the Wool Marketing Board, and local wool graders. Breeders were later presented with a comprehensive assessment of their fleeces. Large charts are used at the field day to present all the information collected on the rams, with fleece weights and grades filled in on those days. Test results are then printed and circulated to all Association members with the ownership of each ram clearly indicated. Mean performances for each county in 1965/66 are shown below and on p. 78.

Table 1

Summary of Welsh Mountain ram performance tests 1965/1966

County		Caernarvon	Merioneth	Denbigh	Montgomery	Cardigan
No. of rams		60	60	44	60	25
Days on test		203	195	233	217	224
Initial weight	lb	66·3	63·3	68·4	64·7	59·3
Final weight	lb	102·9	87·3	97·6	92·9	90·2
Gain on test	lb	36·6	24·0	29·1	28·2	30·8
Fleece weight	lb	4·29	4·08	4·97	3·93	3·47
Staple length (in.)	Test period	2·6	2·5	2·6	3·3	3·5
Wool weight inch^2 (g)	Test period	1·03	0·78	1·00	1·23	1·04

Counties should not be compared with each other because of differing environments and duration of tests. We are really concerned with the variation within the sample of rams tested in each county and large differences were recorded between the top and bottom rams in all the characteristics measured. Records of some of the best rams in one county test during 1966/67 are given in Table 2. Most of these have been purchased for our College flock. Since this occurred after a common test period of eight months, it is reasonable to assume that much of this variation was the result of the animals' own genetic merit.

Table 2

Records of the 'best' individual rams in the Caernarvon test 1966/1967

Ram	Initial weight (lb)	Final weight (lb)	Gain on test (lb)	Fleece† weight (lb)	Staple length (in.) Year	Test
181	69	150*	81	5·81	5·2	3·7
149	62	135	73	6·62	5·1	3·3
152	79	135	56	7·87	7·0	5·0
142	74	132	58	7·56	6·8	3·3
182	75	126	51	9·62*	6·5	4·1
151	62	114	52	9·12*	9·0	4·6
153	65	122	57	8·00	6·7	3·7
195	64	113	49	8·31	6·8	3·7

*outstanding performance for shearling Welsh mountain rams on pasture
†refers to washed wool

The importance of weight gain during test was possibly over-emphasized in the first year since light weight rams at the beginning of the test tend to gain more weight than the heavier ones. Attention is now focussed on final body weight (13–14 months of age). Likewise, we are able to explain fleece weight differences in terms of body weight, staple length and weight of wool per unit area. In most of the tests weight gains have had little effect on fleece weights.

Two further tests have been completed in each county and plans are well advanced for the 1968/69 season. We have always been conscious of the fact that more animals should be tested at each centre and that the five counties should be able to compare their rams together at one or two centres. A large central performance testing station for at least 300 rams, in addition to the county tests, is envisaged and we have hopes that the Meat and Livestock Commission will play a useful part in this work. However, in the short term, the feasibility of a central test is being examined on the Bangor University College Farm. Fifty ram lambs were accepted for test in October, 1967, i.e., ten from each of the following counties: Caernarvon, Cardigan, Denbigh, Merioneth and Montgomery. They were wintered together on the lowland until May (no hand feeding) and then kept on the enclosed hill or ffridd until the beginning of September. The results have been extremely interesting in that county differences, admittedly based on a small sample, are extremely small. Ranking of rams on body weight at the end of May (normal end of test) and at the end of August are in close agreement and there is as yet no clear indication that some rams do better in summer than in winter. These rams were exhibited in a novel way on the N.A.A.S. demonstration area at the Royal Welsh Show and at a large gathering of sheep farmers at Bangor at the end of test. Individual rams were penned according to their position for final body weight and fleece weight. For example, all the rams well above the average for both body weight and fleece weight were in one corner, while those below the average were in the opposite corner. Performance of individuals must be related to the flock average, progress depends on identifying and making full use of animals well above the average for body weight and/or fleece weight. There is probably little difference in breeding ability between rams in the top 10 per cent. In essence, one would expect members of, say, the high body weight-group to sire heavier offspring (at 1½ years of age) than rams of the low body weight-group when mated to comparable ewes.

Conclusions

Performance testing helps to identify the rams that are superior or inferior for characteristics that can be measured. There is, however, little point in conducting these tests unless full use is made of the 'top' recorded rams. Ideally these should be used in elite flocks, i.e., those of a high standard of performance and supplying a large number of rams for sale. Thus, progress made in these flocks will be reflected in the quality of the rams offered for sale. In practice, all this will depend on possibly two factors.

Firstly, acceptance of performance records to reinforce or supplement normal selection. This is really an exercise in communication and one must still accept the fact that 'seeing is believing' as far as many sheep farmers are concerned. Field days and demonstrations with simple but clear objectives, active participation in record collection, especially by the younger generation of farmers and shepherds, and the integration of records in sale catalogues would all help to make testing worthwhile and meaningful.

Secondly, all tested rams should at the present time be of acceptable type. There are sufficient ram lambs available to enable a reasonable degree of screening on type to be practised on entry. After all, it is pointless to test rams that no one will be willing to use afterwards.

Co-operative groups are being encouraged to buy or retain 'top' rams and to mate them to proven ewes in several flocks. In breeding one lives in the hope that the next generation will be better than the present one; performance testing can help us to attain this objective.

Much remains to be done to provide further, better and more permanent facilities for testing sheep that, notwithstanding certain developments in farming, are the only means of utilizing to advantage poor mountain grazings as well as better lowland pastures.

Acknowledgments

It is a pleasure to acknowledge the unlimited co-operation of my friends and partners in this venture, Messrs. K. V. Ellis, W. D. Griffiths, C. H. Edwards, G. Edwards, E. E. Jones, J. D. G. Jones, I. Parry and E. L. Jones of the National Agricultural Advisory Service; E. Hanson of the British Wool Marketing Board, and all members of the County Associations of Flockmasters in Wales.

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Cereals in the United Kingdom

Their Production, Marketing and Utilization

A Comprehensive Survey of the United Kingdom Cereal Market, prepared by Denis K. Britton as Director of a Survey commissioned by the Home-Grown Cereals Authority, will be available in mid-February, 1969. The price is £8 and is obtainable from Home-Grown Cereals Authority, 13/15 John Adams Street, London, W.C.2. A pre-publication discount of 25% can, however, be obtained if an order is placed before **19th February, 1969.**

Potato Growing in Holland

G. A. Hill

In April of this year a large chemical organization in Britain arranged for a party of farmers to visit Holland to study potato growing. During the week's tour an extremely valuable exchange of ideas on many aspects of Dutch and British farming resulted.

Visits on the first day to research stations, particularly the Institute for Research on Varieties of Field Crops (I.V.R.O.) and the Institute of Agricultural Engineering and Rationalization, both sited at Wageningen, near Arnhem, laid a solid foundation for the rest of the tour. This consisted of visits to typical Polder land farms, a co-operative potato store, and on the last two days to two large-scale farming estates at Numnansdorp and Wilhelminadorp. It is interesting to note that approximately 330,000 acres of potatoes are grown and that there are four million tons to be disposed of each year. Direct sale of potatoes to the public is decreasing, while the sale of processed potatoes is increasing. A large tonnage goes for starch production and also for animal fodder.

At the I.V.R.O., which is the Dutch equivalent of the National Institute of Agricultural Botany, work is being done on testing and classifying varieties, and each year a Descriptive List of varieties of Field Crops is published. Trials with potato varieties are important in view of the large export market for Dutch potatoes, both as seed and ware. Something over a quarter of a million tons of seed and 200,000 tons of ware are exported each year. A complete and accurate tie-up between variety testing in other countries and with work in Holland is, therefore, vital.

The Institute of Agricultural Engineering and Rationalization was set up to further the efficient use and the improvement of technical aids and work methods in Dutch agriculture, with particular reference to the association of men and machines. It has, therefore, two main departments:

1. For research and testing of new machinery and its application.
2. For research into direct labour problems.

There is also a department for the study of future trends, particularly labour productivity, the development of contract working, machinery co-operation

Close view of tilth obtained by a Dutch grower

and the economics of repairs and renewals. It is certain that treating research into labour and machinery as one subject is important. Progress in mechanization without research into the mental approach of the workers involved can lead to an overall drop in labour productivity and, therefore, in farm income. The Dutch believe that integrated results can be offered as a 'packet' for direct application on the general farm.

From the practical agricultural point of view the immediate impression is one of neat farmsteads, with each and every acre having to pull its full weight. Forty per cent of all Holland has been reclaimed from the sea and this is reflected in their attitude. Ploughing is carried out right to the dyke edge, often by a reversible extended-arm plough, and cropping is also complete. Great emphasis is placed on being able to do the right job at the right time, and to do it well.

Whether grown on a large or small scale, the overall Dutch technique of potato growing is approximately the same, and the main points in their annual programme for the crop are described below.

Land preparation

The basic approach to ploughing is no different from ours. If possible, it is carried out in early autumn under dry conditions to cut down smearing risk, and the furrows are well turned over. Contrary to popular belief, there can be a considerable clay faction in the soil so good weathering is vital. Seedbed preparation in the spring is obtained as quickly as possible without bringing up any 'raw' clods. There has been a marked swing to the use of reciprocating power harrows to obtain the desired tilth in preference to rotary cultivators, which are more likely to bring up wet material and produce a 'cloddy' seedbed.

Handling seed before planting

The Dutch grower places more emphasis on seed size than his British counterpart. British growers have been forced to consider a top riddle size of two inches because of the increasing popularity of the fully-automatic planter but, in many cases, this is as far as it has gone. In Holland, grading

A rotary harrow/ridger working at the Manor of Crowstrijen

within half an inch is almost universal. On some of the farms visited $1\frac{3}{5}$–$1\frac{4}{5}$ sets were being planted, particularly where Bintje was being grown, and even this would be split when a poor-shaped sample was being riddled.

There was not sufficient time to investigate the growing of seed potatoes fully, although it was obvious that great attention was being given to obtaining healthy seed, particularly where the seed was being produced for export. The importance of *Rhizoctonia solani* was emphasized. It is a disease which is endemic on many soils, and fungicide treatment of seed is routine practice in an effort to control the disease, again particularly where seed is to be exported.

Chitting techniques practised are variable, although the final product is often the same. On one farm visited, the main crop seed was stored either in bulk or bags until late February/early March. It was then riddled when most of the developed sprouts were knocked off. The tubers were then trayed and further chit development encouraged by exposing the seed to natural light, plus heat, if necessary.

On another holding, seed in bulk was kept to as near 40°F as possible by letting in cool, night air until early March. It was then trayed and the temperature allowed to rise; natural light was again used either by storage in a greenhouse or by loading on to trailers and storing outside. In both cases multi-sprouted seed which will stand up to automatic planting reasonably well was produced. There was an apparent lack of skin spot, which can be a major consideration in this country with seed handled in this way. It was agreed by both the Dutch and British farmers that chitted seed, or at least tubers with their eyes open, are vital if full plant populations are to be achieved.

Fertilizer practice

Great emphasis is often placed on green manuring before planting the crop. The Dutch maintain that 'seed' grass ploughed in during the autumn

helps to maintain soil structure and forms a sound basis for future manuring of the crop. Amounts of phosphate and potash applied vary widely according to soil type, and if potash us used, it is general practice to use sulphate instead of muriate. This is claimed to help prevent 'black spot' incidence.

On average, basic levels of fertility appear higher than in this country and there is very little placement of fertilizer. Phosphate and potash are often applied in the autumn or early winter and worked in, whilst nitrogen is broadcast just before planting or even split, with half being applied in early spring and the other half at planting time. It is interesting to note that on the two farms visited on the Flevopolder no potash was applied for potatoes at all.

Planting and treatment to harvesting

Fully-automatic potato planters can be seen on almost all arable farms. These are two-row or four-row machines with the latter planter being far the more popular. Planting even rows is essential to avoid damage to the crop due to planting on the wheelings. A further reason is the increase in popularity of the two-row harvester—there is less difference in row widths and, therefore, less risk of a damaged crop.

Final ridging is often done by using an inter-row cultivator/ridger which is matched, as far as possible, to the numbers of rows planted. Big differences in ridge shape were noticed where a three-row ridger was used behind a four-row planter as opposed to a four-row ridger. The unbalanced sequence often leads to a narrow third ridge with resultant greening and more side compaction.

Row widths are between 28 and 30 inches with a swing to wider drills in recent years. Plant populations vary between 15,000 and 20,000 per acre for the ware crop. Farmers planting the lesser plant population claim that they obtain a more uniform crop size, possibly due to the use of multi-sprouted sets. For seed production, plant populations of up to 24,000 per acre are set.

Weed control is nearly always by cultural means and kept to an absolute minimum after the final ridging-up. By far the most important consideration during this period is the control of potato blight. It is not uncommon for Dutch farmers to spray at least twelve times during the season with either a dithiocarbamate, or tin, or a mixture of both.

Burning-off is common practice. What is surprising is the extent to which arsenicals still appear to be used for the job. This material has not been used in Britain for several years because of risk to operator and livestock.

Harvesting

Most of the crop is harvested by machine. Two-row harvesters are the most popular, some of the machines being capable of lifting five acres per day. As the soil is mostly stone-free the harvesters can be operated with very little labour and this helps to maintain a high output. Off-loading is directly into trailers which, in turn, are fitted with moveable floors to facilitate removal at the store. If any further separation of soil and rubbish is necessary, it is done at the store. Most of the farms visited had their own storage, generally fully-insulated with under-floor ducting and slatted laterals.

Co-operation

During a visit to a Potato Growers' Association Store at Dronton we saw what can be done in a relatively short number of years in the field of potato storage, grading and marketing co-operation. This was started in 1964, with sixteen founder members, to handle the members' potato crops from lifting to selling. By 1968 there were 175 members dealing in seed, ware and potatoes for processing stockfeed. During 1967–68 approximately fifty-two thousand tons of potatoes were handled and holding capacities have now risen to ten thousand tons. Provision has been made for the separation of different consignments of potatoes by having part of the storage capacity split into twenty-two compartments holding 150 tons each, and nine compartments of 250 tons capacity each. Reserves are maintained by imposing a one per cent levy on total returns.

To sum up—farms are well-equipped from the point of view of potato machinery. Very quick planting and harvesting are looked upon as essential. Even the smaller arable holdings we visited carried a full range of machinery and the general philosophy is to be geared to go into action when conditions are right.

Top yield levels are no greater than those that can be achieved in this country but, in general, the Dutch farmer is more likely to reach this maximum. The Dutch have developed their skills to combat the physical limitations of their country, and their attention to detail must contribute greatly to their efficiency and success.

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The Ministry's Publications

Since the list published in the January, 1969, issue of *Agriculture* (p. 41) the following publications have been issued.

MECHANIZATION LEAFLET

No. 25. Food Mixers (New) 1*s.* (by post 1*s.* 4*d.*)

FIXED EQUIPMENT OF THE FARM LEAFLETS

No. 5. The Milking Parlour (Revised) 3*s.* 6*d.* (by post 3*s.* 10*d.*)

No. 13. Cattle Crushes and Equipment (Revised) 2*s.* 9*d.* (by post 3*s.* 1*d.*)
(Formerly Cattle Crushes)

FREE ISSUES

ADVISORY LEAFLETS

No. 29. Compositional Quality of Milk (Revised)

No. 534. The Wild Rabbit (Formerly The Rabbit) (Revised)

SHORT TERM LEAFLET

No. 38. Production of Early and Maincrop Tomatoes in Heated Glasshouses (New)

UN-NUMBERED LEAFLET

Tractors Overturning (Revised)

The priced publications are obtainable from Government Bookshops (addresses on p. 96) or through any bookseller. Single copies of free items are obtainable from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

20. South West Herefordshire

G. A. Hill

BOUNDED on the north by the River Wye and on the west by the Black Mountains, this part of Herefordshire is scenically one of the most beautiful in England. As yet, the area is still completely rural and, whilst there has been the inevitable drift from the land into the City of Hereford, the whole economy is still closely bound up with agriculture.

The height above sea level varies from over 2,000 ft on the Black Mountains to 100 ft at the Wye Valley. With stock varying from mountain ewes and single-suckled Hereford cows to paddock-grazed dairy cows kept at a stocking rate of under one cow to the acre, and cropping ranging from the production of stock seed potatoes in the hill areas to the lowlands capable of producing over 20 tons of quality ware per acre, it is difficult to envisage an area with so many differing facets.

Soil type, with the exception of the Wye Valley, which is partly alluvial, is predominantly derived from Old Red Sandstone. Soil texture varies from light, brashy loams to medium heavy, silty, clay loams. Rainfall amounts also vary widely with over 50 in. per annum along parts of the Black Mountains to half that amount ten miles away on the lowlands.

Nearly all the upland holdings are family concerns averaging approximately 80 acres in size. The majority are owner-occupied or family owned. One of the major problems is the lack of confidence among the younger

people that the small upland farm still holds a future for them, and it is not surprising that the average age of the farmers is going up. The farming pattern is by tradition one of store animal production for lower land fattening, although the proportion of fat lamb sold has been rising steadily over recent years due to improved grassland and grassland management, more autumn and early-winter fattening off roots and, of course, better breed type. Stockmanship is of a very high order and this has enabled, at least in part, these rearing farms to keep their identity and provide a reasonable return.

Over the last fifteen years, the production of high-grade stock seed potatoes has become an important ancillary enterprise on some holdings. Favourable isolation, freedom from aphids and warm lifting conditions enable a disease-free tuber sample to be grown and over the years a good market has been developed.

Recent years have also seen the area grow in popularity as a recreation centre with the village of Longtown forming the springboard for hiking and pony trekking holidays. Many cottages and old houses have been bought and modernized where necessary to provide urban dwellers with week-end accommodation. This has helped to open the area up and indirectly increase its prosperity.

The lowland part of the area is dominated by the Golden Valley, an 'L' shaped valley running from the eastern side of the district almost to the Welsh border at Hay-on-Wye. Here again, tradition has it that animal production forms the basis of farming practice. Fat lamb, produced mainly from Clun, Radnor, Welsh and Scots Halfbred, and Kerry ewes, and two-year old fat cattle mainly from Hereford and Hereford Cross cows are sold at Hereford and border markets. As with all fertile soils, the acreage of ploughed land has been steadily increasing over the last decade. Corn acreage, especially winter wheat and spring barley, has risen sharply and in the wake have come fresh problems. Grain shrivelling, particularly on winter wheat, has become serious, so much so, in fact, that the expression 'Golden Valley Disease' is now used to describe it. It is now well established by trial work over the last four years that foliar diseases, mainly septoria and mildew, are largely to blame, but work still remains to be done to find an economic solution.

Deep soil, not hampered by arable overcropping, lends itself to potato growing and very high yields are being obtained in the Golden and Wye Valleys. Up to now, it has been possible to almost completely control blight. With a first-class seed multiplication area close by some of the more progressive ware growers are renting or exchanging seed-growing land so that the whole job is kept under their control.

Because the dairy cow has only been mentioned in passing does not mean to say that it is not well represented. Predominantly Friesian herds are often being kept very intensively under controlled grazing systems. The most efficient producers are usually to be found in the more sheltered valley areas, but not always so. For instance, one of the most viable units in the whole county is to be found in the Black Mountains.

Historically, stockmanship has played a vital role in the prosperity of the area. Changes, due to modern economic pressures, have illustrated that the farming community can adapt itself to new techniques to advantage without losing any of its inherent skills.

Flow Movements within Farm Buildings

N. D. Hunter, *Agricultural Land Service, Exeter*

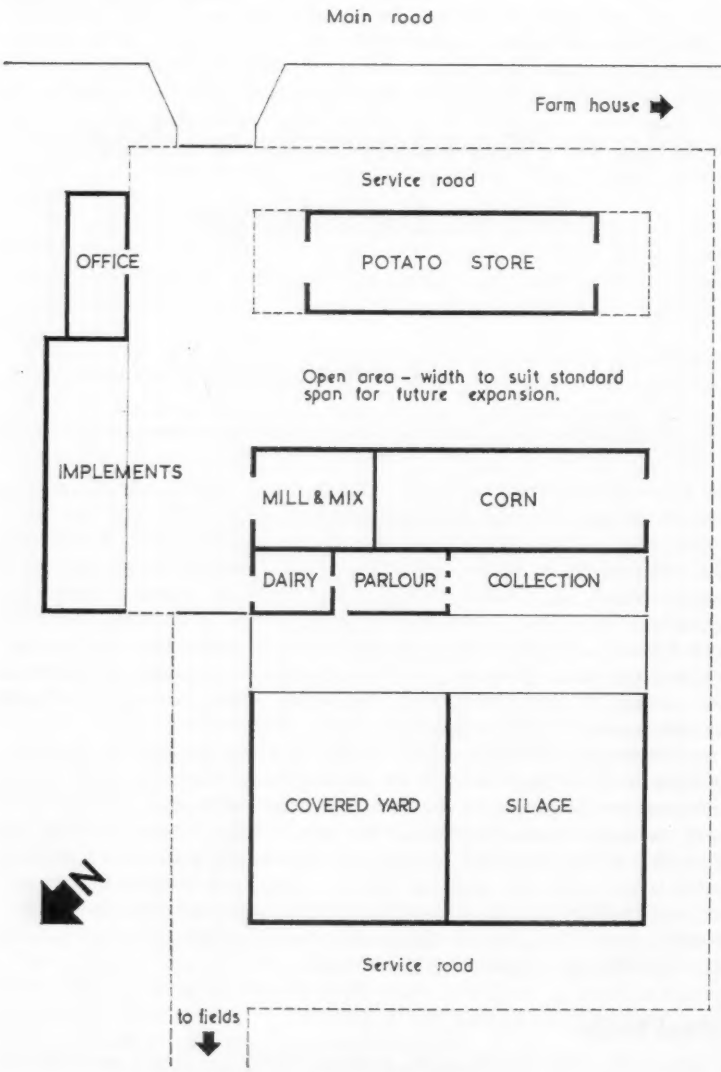
THERE are several principles affecting the layout of farm buildings, such as the nature of the site and the availability of services. Perhaps the most important one is 'flow movement', though this is often given insufficient weight and sometimes ignored altogether. This concerns the movement of materials, stock and labour between and within the various enterprises. Every farmer who has to work in an existing set of buildings that has expanded piecemeal with every change of enterprise emphasis will, however, realize its importance. The siting of buildings should primarily be governed by the intensity of traffic between them and the relative importance of each traffic movement, coupled with an eye to the future.

It may be argued that this is all very well with a bare site, but most changes and additions of buildings occur in an existing set-up. Certainly the principle can be more easily applied in the new farmstead but it also holds good in cases of extensions and alterations. One must, within reason, consider the future policy of the farm and then analyse the various activities to produce a logical layout. How far ahead a farmer should look is open to personal choice, but perhaps ten years foresight is about right, as farming can then be coupled with a policy of short-life/low-cost buildings, which allows greater flexibility for re-planning in the future.

External traffic

In analysing these activities the external traffic should, if possible, be separated from the internal traffic. External traffic is the flow from outside the farmstead to the buildings, and internal traffic is the flow from building to building and within individual buildings. It does make for smoother running and management if the two types of flow movement can be kept from crossing. However, in either case, the movement of men, stock and materials should be reduced to the lowest frequency and shortest distance.

The sketch plan is an attempt to illustrate what is meant by 'flow' and to portray some of the factors that need to be taken into account. The activities considered are dairying, corn and root crops, the external traffic movements for which would be:



1. Cows from field to parlour in summer
2. Milk lorry to dairy
3. Implements from shed to fields
4. Slurry from covered yard to field
5. Corn from field to store
6. Potatoes from field to store
7. Potatoes and corn from store to merchant
8. Concentrates from merchant to store
9. Grass from fields to silage clamp

Of these, the one with the greatest frequency is the cow movement between the fields and the parlour. Hence the milk buildings are sited on the side

closest to the fields despite the disadvantage of their being at the furthest point from the main road and, therefore, the milk lorry. However, the cows come from the fields in various directions twice daily and would interfere to a greater extent with other movements. Nevertheless, the dairy itself is sited on the main farm access road to minimize wear and tear by the lorry. Another movement of high frequency is that of implements to the fields. Here, again, the shed is positioned to allow the easiest access to points of work and to give the least interference with other movements. It is also convenient for the main road should breakdowns, etc., occur and, again, only the main access road is used. The potato and corn stores are sited close to the road to provide the shortest distance of entry for the merchants' lorries. The corn store is placed further from the road as it also has a traffic flow to the cows. Provision is made here for the crops to come in from the fields at the south end to prevent too many flow movements running the risk of crossing on the main farm road.

Internal traffic

The internal traffic movements are:

1. Cows from covered yard to parlour
2. Cows from covered yard to silage
3. Concentrates from store to parlour
4. Milk from parlour to dairy
5. Straw from silo to covered yard

From this it can be seen that all internal traffic is centred on the cows and, to reduce the frequency and distance of the necessary work routines in producing milk, the buildings concerned are grouped together. They are also sited in such a way as to eliminate, as far as possible, interference with external traffic. Obviously there has to be give and take between the various activities, as is demonstrated by the siting of the corn store where there is a pull by both an internal and external flow movement. It is only by a proper analysis of these activities that it will be possible to reach the best solution. Even so some compromise is almost inevitable, though not necessarily harmful if it is reached after consideration, rather than imposed by unforeseen circumstances.

The farmhouse is positioned away from the farmstead to mirror the growing trend to have a farm office. The need to have a farm office reflects the increasing importance of accounting and recording in farming. The analysis of the various farm activities which this makes possible can be expected to provide a true guide to the directions in which the farm should develop and thereby help formulate the policy on which to produce a logical layout. It is at this stage that the advantages that can be derived from proper flow movement need to be borne well in mind and this becomes increasingly apparent if it is realized that the farm labour force spends approximately 70–80 per cent of available time in and around the buildings. Compromises will be inescapable but the best way to face them is by assessing the relative importance of each enterprise and the labour, stock and material movements. This, in effect, is a form of work study. More and more attention is being paid to the help work study can provide on the farm. This strengthens the argument for considering 'flow movement' requirements when siting and extending buildings. Thus with the increasing costs of labour, the intensification of production and the advance of technology in farming correct flow movement within farm buildings becomes increasingly important in order to achieve maximum benefit.

in brief

- **Structure of dairy farming**
- **Processors call the tune**
- **Devon farm survey**

Structure of dairy farming

IF evidence were needed of the stable character of our dairy industry, it is clearly to be found in the Milk Marketing Board's survey* covering the years 1963–67. The flexibility from which it derives its strength is apparent from the new pattern of milk production which is replacing the old. In the four years under review some 25,000 farmers stopped selling milk, while 4,500 new producers came in, so reducing the total of active producers in England and Wales to 88,790. But the loss of milk from outgoing producers was more than counterbalanced by the output of new producers, those transferring to new farms and the expansion of production by the continuing producers whose sales off farms rose from an estimated 1,694 million gallons in 1963–64 to 1,880 million gallons in 1966–67.

The movement out of milk is shown to have been greatest in East and South-East England and lowest in the Mid-West, and of the dairy farmers who had left milk production by March 1967, most were the smaller producers not necessarily relying on milk for the greater part of their income. One-third of them were over 60 years old in 1963–64. The exodus has been particularly noticeable among the very small farmers—men farming less than 25 acres. Just on one-third of these left milk production between 1963 and 1967. Another sector that has felt the wind of change is those farmers (32 per cent) who relied entirely on hired labour for manual work. The group least affected was that where family labour and both full-time and part-time hired labour were available.

The new producers entering milk production are relatively young, and they tend to specialize more on milk than the average. The fact that the newcomers of 1963–64 raised their output by over 22 per cent in two years over their first full year of production is not without its significance; for dairy farming is increasingly becoming a business governed by the economies of scale and specialization. Capitalization costs in land, buildings, equipment and stock are high, and it is therefore inescapable that only by greater efficiency can the key to a successful milk production be found.

The analysis of the metamorphosis overtaking the cowsheds of England, whilst revealing fewer hands milking the national herd, also shows that while the seasonality of total supplies changed very little during the four years, that of individual producers was highly unstable. In 1966–67 only 38 per cent of all continuing producers were in the same seasonality group as in 1963–64. The fairly extreme summer and the extreme winter producers seem to have expanded output more than other continuing producers, but most of the other groups behaved so similarly that the seasonal pricing system does not seem to have exerted a definite pressure towards a specific seasonal production pattern during this period. Seasonal stability increased markedly with producer size—almost three-quarters of the very large producers kept in 1966–67 within the same or a similar seasonality group compared with 1963–64, but fewer than half of the very small producers.

*_Changes in Milk Output 1963-67_, Milk Marketing Board, Thames Ditton, Surrey, price 10s. 6d. incl. postage.

Processors call the tune

THE wide selection of processed vegetables and fruit in cans and packs that bring out-of-season foods to the table as a matter of course is the outward sign of a revolution at the heart of which is the plant breeder. The increasingly insistent demand by processors for varieties specifically suitable to give an attractive and flavoursome product is today so important as to justify considerable research in an area once regarded as being not much more than supplementary to the provision of fresh food in season.

Smallness of size, for example, is commonly associated in the consumers' mind with young and therefore more tasty produce; thus canned 'new' potatoes, small carrots, baby beet, frozen Brussels sprouts and beans. Hence outside what can be done in field practice, it is to the plant breeder and his manipulation of plant genes that processors are looking to give them what they want. Early- and late-maturing varieties are called for to spread the season, and this in turn must have its repercussions on growers in the availability and organization of their labour, to say nothing of imposing a need for special and expensive harvesting equipment. Fruit for processing is required to be of good colour and firm texture and to have all the attributes, assessed by eye and taste, after processing that will ensure its ready sale.

All in all, plant breeders, and growers too for that matter, have their work cut out responding to processors' demands; and we may be sure that it will go on, since the luxuries of yesterday have a habit of becoming the commonplace of today.

Devon farm survey

A MORE detailed picture of farming in Devon has emerged from the latest survey carried out by the University of Exeter. Begun in 1965, this survey was organized on the basis of a postal questionnaire sent to 10 per cent of farmers in the county. The level of response (two-thirds) has been gratifying and in the view of the authors of the report,* S. R. Morris and E. T. Davies of the University's Department of Economics, supports the contention that postal surveys merit a wider application than hitherto in the field of agricultural economic research.

The county's total agricultural area of 1,313,751 acres is farmed by 14,450 occupiers, with dairying accounting for 674,519 acres, livestock rearing and fattening 404,322 acres, mixed farming 145,884 acres and pigs and poultry 35,500 acres. Of the livestock population, cattle total 520,400, and of these herds on four out of five farms were found to be composed of dairy type cows only; sheep number 1·4 million, pigs 277,600 and poultry 4 million.

Classification of farms on the basis of standard labour requirements disclosed that only 9,214 farms (64 per cent) could truly be designated as *full time* (i.e., requiring a minimum labour input of 275 standard man-days); 2,166 farms (15 per cent) requiring between 55 and 274 smd are defined as *part-time*, and the rest, numbering 3,070 farms, requiring under 55 smd are designated as *residential*.

Full-time family farms calling upon no hired labour still predominate in this corner of England (54 per cent), and the majority of part-time farms (89 per cent) are also family units. Moreover, on one-half of the full-time farms the regular labour force was found to consist solely of the farmer and his wife; only at harvest time and other busy periods was assistance called in. Nearly all farms in the county are under 50 acres, and three-quarters under 100 acres.

The wealth of statistical data which has been evolved from this survey must be of unquestioned value for the south-west region and in the counsel of advisers already in the field.

*The Devon Farm Survey, 1965. Part I 5*s*., Part II 10*s*.

Books

Living for Life. A Dutch view in word and picture of agricultural research. Pudoc, Wageningen, 1968. Dfl.25 (approx. £2 17*s.*).

At Wageningen there is a community of 4,000 persons engaged in agricultural teaching and research. The family includes some thirty research institutes and even a small body of extension workers, all under the fatherly care of the University, which celebrated its fiftieth birthday in March, 1968. To mark the occasion, this presentation volume was produced under the aegis of a small committee of Directors of Institutes.

The reading matter is very brief, covering only twenty-three pages. In this short space there is reference to many facets of 'the interplay between agriculture and science'. The evolution of agricultural science is traced from Jethro Tull (revered certainly, but scarcely Reverend) onwards. In the Netherlands, agricultural science is interpreted widely to cover food storage, preparation and marketing, and their general preference is for institutes based on scientific disciplines rather than on particular farm products. Research moves on, from field experiments involving so many uncontrollable factors to growth cabinets, soil bins and monozygous twins. The final chapter describes the present organization of agricultural research in the Netherlands; this, to me, seemed to sacrifice clarity to brevity.

The book consists mainly of over one hundred pages of fine photographs with the briefest comments. The pattern of arrangement is not very well defined but, generally, the plates illustrate progression from primitive farming to sophisticated research techniques and, finally, to food consumption.

As befits a presentation volume, the production is quite magnificent, and it would be a welcome addition to any library.

H.G.S.

English Agriculture in 1850-51. JAMES CAIRD. Frank Cass, 1968. *Six guineas.*

It is unusual to be asked to review the second edition of a book first appearing more than a century ago when the repeal of the Corn Laws had just been completed. Although this occasioned great popular rejoicing, agricultural opinion on the merits of the repeal was not unanimous; in any event, the country seemed poised for a new agricultural era. A review of agricultural conditions at the time seemed, therefore, necessary and topical.

Although only thirty-six when the book, based on a series of letters commissioned by *The Times*, was published, Caird had already established a reputation as an objective commentator on agricultural topics with a clear narrative style. He was to write all his life on rural affairs with increasing authority. He had a serious and penetrating mind, a steady matter of fact approach free of much of the emotional expression and stylistic ornamentation fashionable at the time. The result is fifty-six perfectly absorbing chapters or 'Letters' and 'Conclusions' recording his journey through every part of England, the conditions of farms he saw, descriptions of current husbandry techniques, comments on local customs and some sympathetic glimpses of the lot of agricultural workers at that time. We get his picture of local worthies, some of them great names still remembered. In one passage, Mr. Lawes of Rothamstead Park explains to the author his experiments in agricultural chemistry so well received by the Royal Agricultural Society.

In this illuminating and carefully observed account of the rural scene and its people, inevitably comparison with Arthur Young is made. Caird himself contrasts his findings with Young's account. He gives comparisons of prices and costs of 1780 with those he found. Rent increased 100 per cent in the seventy years, wheat yields went up 14 per cent and workers' wages 34 per cent. It is not in figures alone that change is to be measured and Caird's review is of an industry nearer ours today than Young's was to him.

It is tempting to emphasize the fascinating variety of Caird's account of his travels and to assert that every reader will find in it something of interest. Admittedly, no longer is 'incendiarism prevalent in Cambridgeshire' but in other respects the book is a salutary reminder that many present-day farming problems are hardly new and merely reappear from time to time. The author reports some of the topics

he heard, discussed and noted carefully; pig housing, slats, manure and slurry handling, the profit and loss of sheep keeping, wages and conditions of workers and rental values of land. These causes of mid-nineteenth century head-scratchings are still with us in modern dress.

This book can be confidently recommended and would undoubtedly bring pleasure to anyone interested in British agriculture. *R.G.A.L.*

Growing Cereals. IMPERIAL CHEMICAL INDUSTRIES. Kynoch Press, 1968. 12*s.* 6*d.*

This booklet covers a very wide field since it surveys all aspects of cereal production in Britain at the present time. Inevitably, this means that contentious topics tend to be dismissed briefly and it is likely to be criticized in some quarters on this account. However, as a practical guide for ready reference it is likely to find favour with a large section of the industry. There is a good index and summaries at the end of each chapter bring out the most important points very clearly.

The first five chapters are concerned with cultivations, sowing the seed, fertilizers, weeds, pests and diseases. These are followed by a chapter dealing with cropping sequences and profitability. Although a great deal of trouble has been taken to assemble information from a large number of sources this chapter clearly demonstrates the need for more critical evidence on the effects of break crops. The final three chapters deal with harvesting, drying, storage and marketing in an interesting and practical way.

Throughout the book good use is made of tables, line drawings and photographs, both in black-and-white and colour. Some very good colour studies of sixteen weed seedlings are included. The weeds illustrated have been carefully selected to represent those most commonly found in cereal crops. This is bound to make the correct identification of troublesome weed seedlings an easier task and is a welcome advance on previous illustrations.

Naturally enough, consideration is given to where I.C.I. products fit into the production pattern and precise recommendations, quoting the trade names of the products concerned, are mentioned.

Copies of *Growing Cereals* may be obtained *only* from Kynoch Press, Witton, Birmingham, price 12*s.* 6*d.* *J.N.A.B.*

Agriculture in the Australian Economy. Edited by D. B. WILLIAMS. Methuen, 1968. 56*s.*

This book contains a series of reviews, subscribed by sixteen leading agricultural economists, which describe the significance of agricultural industries in the Australian economy. Chapters 1 and 2 deal with the history, development and structure of the agricultural sector. It is largely a story of booms and slumps, of over-optimistic expectations of farmers and graziers not being realized. The State has played a major role in providing a transport system, electricity to farms, irrigation works and so on. It presents a highly capitalized and extremely specialized form of primary production geared mainly to the export market, with a high land to labour ratio; one person, on average, to 4,228 acres of farmland. Chapter 3, 'Innovation in Agriculture', discusses attempts that have been made to overcome the problems of farming in a difficult environment; of land clearing, providing fencing and water supplies, the control of pests which includes the grim but fascinating attempts to exterminate prickly pear and rabbits; of improving plant and animal production.

Chapters 4, 5 and 6 consider the role of the State in rural research and agricultural education; the part played by primary producers organizations—assessing the efficiency with which farmers' associations and unions have achieved their purpose of protecting and advancing their economic welfare; the contribution of agriculture to the Gross National Product (25 per cent in 1950 falling to 12 per cent in 1965) and to exports (74 per cent in 1965). In Chapter 7, estimates are made of changes in the supply of agricultural products. Since the 1950s, farm output has increased at 3–3·5 per cent per annum but there have been substantial changes in the rate of growth of output for individual products. Chapters 8–11 cover the main factors of production—land policy, rural labour, farm investment and credit. Of particular note is the fascinating discussion of land policy issues, including alienation and closer settlement problems. Chapter 12 gives an interesting account of agricultural development projects. These have mainly been concerned with bringing part of Australia's vast marginal lands into production: they include both dry land development and irrigation schemes which mainly lie in the Murray-Darling basin. Despite the large funds devoted to these types of development, the author points out that 'satisfying economic criteria for inter-project comparison are still lacking'.

The last four chapters deal with changes in food consumption, marketing of agricultural products with a good discussion on the wool auction system, agricultural price policies which have sought to stabilize prices but with harmful consequences and trade in agricultural products. Agricultural trade policy has mainly been concerned with improving Australia's competitive position and reducing instability—the latter being only partially successful.

Taking the book as a whole it is a very workmanlike study, attractively produced—the charts are particularly well done. It is a comprehensive survey of all the major aspects of Australia's rural economy and as such can be recommended as a valuable reference book.

E.S.C.

Farming in the West Country. NORMAN HICKS. David Rendel, 1968. 35*s*.

At last, it seemed, a book had been written about farming in the South West. For a long time there has been a need for such a book for prospective farmers, students and others; but, alas, this one will do little to help them. This is all the more surprising because of the high national reputation of the author as a journalist. One gets the impression that during a winter evening he sat comfortably in front of his fire with a tape recorder and dictated the nostalgic thoughts which passed through his head.

There is more to the South West than this; there are dynamic changes which Mr. Hicks has not taken fully into account. For instance, Chapter 4, dealing with the farming areas of Cornwall, infers that cereals cannot be grown except for some mixed corn and a limited area of barley. However, the facts as shown in the official statistics published by the Ministry of Agriculture are that since 1943 mixed corn has declined in acreage by 66 per cent while barley has trebled.

Several sketch maps are provided, which could be quite interesting; but their origin is not acknowledged, and one is left with doubts about their authenticity. For instance, on the 'rear endpaper' is a geological map which has inaccuracies compared with the accepted official geological surveys. The author is apt to confuse soils with geological formations, and throughout the book he is inclined to mix 'cause and effect'. Too often the book deals with agriculture in general, instead of making the South West its starting point.

J.A.R.

The Early Horticulturists. RONALD WEBBER. David and Charles, 1968. 40*s*.

This is a history book about people and especially about outstanding British people who, over the last four hundred years, have made their livelihood from the commercial aspects of horticulture. The book has, therefore, a particular appeal for growers, nurserymen, farmers and seedsmen. But the scope is such that all horticulturists, professional or amateur, will find fascination in the 183 pages of text and 32 of appendix and bibliography. Illustrations comprise 29 monochrome plates and three line drawings. Of the former, eleven are portraits of famous horticulturists of the past.

The first chapter traces the development of horticulture in Britain from pre-Roman times to A.D. 1900, while the remaining thirteen, commencing with Richard of Teynham, Fruiterer to Henry VIII, are entitled under the names of leading horticulturists down to Alfred Smith of Feltham, who died in 1927. The story of each character is, however, laced with anecdotes and descriptions of those sectors of horticulture in which he or she specialized. The book is not entirely free from error, there being a curious one on page 121 which infers that the cattle breeding Lord Scudamore died in 1671 and that Thomas Andrew Knight carried on his work, although Knight was not born until 1759.

R.G.

The Agricultural Notebook. (15th Edition). Edited by Dr. IAN MOORE. Iliffe Books, 1968. 45*s*. (by post 46*s*. 7*d*.).

The Agricultural Notebook is invaluable to farmers and agricultural students, and specialist research workers should find it a source of information on the less familiar branches of farming. In fact, anyone even remotely concerned with agriculture, forestry or the land, should find the book of considerable value.

This edition has been revised under the editorship of Dr. Ian Moore, in collaboration with over twenty leading authorities. New chapters have been included and many chapters practically re-written. They have done an excellent and worthwhile job.

The subjects, too many to list here, cover all aspects of farming, including animal health and diseases, beekeeping, dairying, crops, farm management and machinery, forestry and weed control.

Agricultural Development and Economic Growth. Edited by HERMAN M. SOUTHWORTH and BRUCE F. JOHNSTON. Oxford University Press, 1968. £5 14*s*.

Most underdeveloped countries have predominantly agricultural economies. This volume makes the fundamental point that new investment should not only be devoted to industry, but should be allocated so as to increase both agricultural and industrial productivity. This seemingly obvious conclusion was missed in most of the aid programmes of the 1950s and it has taken the comparatively poor results of much of the aid, then given, to bring this point home.

Raising agricultural productivity involves special problems owing to the basic part that agriculture plays and the fundamental relationships between it and the other sectors of under-developed economies. The editors point out that the variety of problems involved preclude the use of economics or any other single science for the planning of development. Furthermore, most of the literature so far available needs re-interpretation for application to these areas.

This volume is divided into fourteen sections written by differing economists (both academic and government) with, at the end of each section, criticisms and discussions by other economists. Each section takes the form of a review of the relevant literature for the topic in question and a summary of current thinking on the problems involved. Jargon is, for once, avoided and the authors have taken care to explain the effects of the various technological, cultural and political constraints precluding purely economic solutions.

In the discussion on international trade, some of the constraints, such as taxation, on the unfettered workings of the law of comparative advantage are mentioned. A multisector analysis of an economy is proposed to find optimum resource allocation to maximize foreign exchange earnings, but the practical difficulties of such an analysis are not discussed. No matter how sophisticated the approach, the results can only be as good as the basic data. In the case of underdeveloped countries, in particular, information of a type suitable for such economic models is generally limited.

Although written primarily for students in the economics of agricultural development (more especially, I feel, for graduates thinking of moving into this field) this volume will be of interest to geographers, sociologists and anyone who is interested in studying the problems involved in aiding the under-developed countries.

S.A.H.

Fundamentals of Modern Agriculture. Edited by C. D. BLAKE. Methuen, 1968. 80*s*.

This book was written by members of the staff of the University of Sydney as a memorial volume to Sir Robert Dickie Watt who founded the faculty of agriculture in the University. The subjects covered are soil and aerial environments, plant biology and crop production, the biology of animals, the biology of micro-organisms and agricultural economics.

The preface states that the book is intended chiefly for senior students studying agriculture in high schools and agricultural colleges. But the level of learning required to really understand much of the text would need a fair knowledge of chemistry, physics and biology, coupled with a sound overall knowledge of agriculture. It would, therefore, seem to be a more useful textbook for the university undergraduate reading agriculture or for the agronomist.

Inevitably, in an attempt such as this to cover a vast subject in one not very large volume, there are omissions, but for those who wish to have the fundamental principles of agricultural production dealt with concisely the job has been well done. The book is well written, presented and illustrated graphically and diagramatically. There is some Australian slant to certain sections of the text, notably those concerned with agricultural economics and crop production, but this is inevitable and reasonable.

T.F.B.

books received

Report of the Agricultural Research Council for the Year 1967-68. H.M.S.O. 10*s*. 6*d*.

Averages of Earth Temperature at Depths of 30 CM and 122 CM for the U.K. 1961-60. Met. 0.794. Meteorological Office. H.M.S.O., 1968. £2 15*s*.

An Operating Procedure for Simulation Farm Planning—Monte Carlo Method. G. F. Donaldson and J. P. G. Webster. Copies from the Publication Sales, Dept. of Agricultural Economics, Wye College, Ashford, Kent. 10*s*. 6*d*. (including postage).

Report on Forest Research 1968. Forestry Commission. H.M.S.O. 20*s*.

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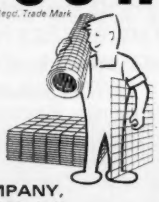

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British Steel Corporation, South Wales Group

OFFICIAL APPOINTMENTS

General agriculturists and agricultural specialists of many kinds are frequently required in the effort to match the large demand from the developing countries. The vacancies advertised below are a selection from the many openings which exist now. While they are being filled, other vacancies are arising.

Salaries within the ranges quoted are assessed on qualifications and experience; and the terms of most appointments include free or subsidised accommodation, education grants, family passages, good leave on full pay, etc. A contributory pension scheme is available in certain circumstances.

Most appointments are limited to candidates who should be citizens of, and normally resident in, the United Kingdom.

BRUNEI

(1) Plant Pathologist

RC 213/28/03

Duties: To draw up new plant importation rules and to work in the field with the local farmers, initially studying surveys of the field of problems involved in the control of diseases in rice, oil palms, fruit and vegetables. Candidates may also be required to teach. Opportunities likely for applied research largely in the form of application trials.

Qualifications: A University degree in Natural Science with Plant Pathology as a major subject and at least 7 years' experience in tropical agriculture.

(2) Entomologist

RC 213/28/04

Duties: Required initially to undertake studies to survey the field of problems covering rice, oil palms, coconuts, fruit and vegetables, and to make recommendations for dealing with them. Candidates will be involved largely in field work in conjunction with local farmers. Some teaching may be involved. Opportunities likely to be open for some form of applied research.

Qualifications: A University degree in Natural Science with Entomology as the major subject and at least 7 years' experience overseas or post-graduate experience.
A knowledge of Malay in respect of both appointments would be an advantage.

Salaries: Brunei $12,240—21,840 (£ Sterling 1,668—2,976) p.a., plus an inducement allowance £327—£556. ($Brunei = 2/8.7*d.*) Tax free gratuity 12½% of basic salary and inducement. Contracts 3 years.

LESOTHO

(1) Pasture Research Officer

RC 213/18/03

Duties: Basic research into veld and pasture management, including the establishment, fertilization and management of planted pastures. Experimental techniques involving travelling within the country.

Qualifications: Honours degree in Agriculture or Botany with previous experience in pasture research work especially in Africa.

(2) Horticultural Officer

RC 213/18/06

Duties: Horticultural development work and the training of extension staff.

Qualifications: A degree or diploma in Horticulture and preferably experience in horticultural work with small scale producers under sub-tropical conditions.

Salaries: Basic, R.2,172—R.4,800 (£ Sterling 1,267—2,800) p.a., plus an inducement allowance in the range £153—£372 p.a. Tax free gratuity 25%. Contracts 2 years.

OFFICIAL APPOINTMENTS

MALAWI

Landscape Architect

RC 213/134/031

Duties: To design and supervise the construction of landscape schemes, including Government official residences, public buildings, parks and botanical gardens.

Qualifications: Candidates must be A.I.L.A. or have an equivalent qualification with experience in landscape architectural practice.

Salary: £1,175—£2,600 p.a. In addition a supplement of £100 p.a. is payable direct to the officer's bank account outside Malawi and Rhodesia. Tax free gratuity 15%—25%. Contract 2—3 years.

MALAYSIA

Agricultural Economist

RC 213/106/07

Duties: To train, advise and assist agricultural economists in the techniques and conducting of market research and investigations. Also to assist and advise in the formulation of agricultural production and marketing policies, including price policies, to aid the Government of Malaysia to diversify its agricultural economy.

Qualifications and Terms: Candidates (aged 35—45 years) should have a good Honours degree in Agricultural Economics and considerable practical experience in marketing and/or agricultural produce.

Salary: Basic, £3,000—£4,000 p.a. according to qualifications and experience, subject to British Income Tax, plus a variable non-taxable overseas allowance ranging from £530—£1,605 p.a. depending on marital status. Contract 2 years.

SWAZILAND

Soil Surveyor

RC 213/169/09

Duties: To undertake detailed soil surveys of irrigation projects, rural development areas, farms or estates, also land capability studies of specific farming systems. The Soil Surveyor will work in close liaison with the Land Planning Officer and extension staff.

Qualifications and Terms: A degree in one of the natural sciences or in Agriculture and post-graduate experience in soil surveying.

Salary: Basic, Rands 2,256—4,800 (£ Sterling 1,316—2,800) p.a. plus an inducement allowance in the range £156—£372 p.a. Terminal gratuity 25% of basic salary and nducement. Contract 3 years.

ZAMBIA

Planning Officers

RC 213/132/05

Duties: To take charge of field planning teams and to be responsible for regional conservation planning on a catchment and/or settlement plan basis.

Qualifications and Terms: A degree in Agriculture or Natural Science, preferably with relevant post-graduate training and/or experience.

Salary: Kwacha 1,944—4,464 (£ Sterling 1,134—2,604) p.a. plus an inducement allowance in the range £243—£429 p.a. A supplement ranging from £233—£291 p.a. is also payable direct to an officer's bank account outside Zambia. 25% gratuity. Supplement and gratuity are free of local income tax. Contract 3 years.

If you wish to apply for any of these appointments, or you are interested generally in an appointment overseas, please write giving your full name, age and brief particulars of your professional qualifications and experience to the:

Appointments Officer
MINISTRY OF OVERSEAS DEVELOPMENT
Room 330a, Eland House, Stag Place,
London, S.W.1.

MINISTRY OF OVERSEAS DEVELOPMENT

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

Experimental Husbandry

Gives accounts of husbandry experiments carried out at both experimental husbandry and commercial farms throughout the country. It should have a wide appeal to farmers, their advisers, research workers and students.

Experimental Horticulture

Designed for commercial growers of fruit, flowers, vegetables and crops under glass, this publication contains accounts of experimental work and its bearing on practical problems in the field.

These publications are issued at irregular intervals (about two or three times a year). Prices range from 6s. to 11s. (postage extra).

Government publications can be purchased from the Government Bookshops in London (post orders to PO Box 569, S.E.1), Edinburgh, Cardiff, Belfast, Manchester, Birmingham and Bristol, or through any bookseller

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